King County Regional Inflow and Infiltration Control Program

Guide Specification

Contract Number CXXXXXC

Volume 1 of 1

Division 1, 2, 3 and 9 - Technical Specifications

June 2004

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

King County Infiltration and Inflow (I/I) Program Guide Specifications

The following set of guide specifications was developed for the King County Infiltration and Inflow (I/I) Program. The guide specifications were established for the eight County managed I/I pilot projects completed in 2004, and will be used as a starting point for any continuing rehabilitation work performed as part of the program.

Guide specifications are provided for the following types of pipe and manhole rehabilitation work:

- Cure-in-place pipe for sewer mains, laterals and side sewers.
- Cure-in-place liners for service connections.
- Folded/formed liners**.**
- Pipe replacement by pipe bursting.
- Conventional dig and replacement of small diameter sewers.
- Manhole liners and coatings.
- Chemical grouting of manholes.

The following items provide guidance for using the specifications and tailoring them for specific project needs:

1. Portions of the specifications are shown in ***bold italics*** and represent example language. These sections need to be tailored to specific project work and conditions of the contract by deleting the example language and inserting appropriate project information.

2. Certain sections and sub-sections of the specifications include instruction or guidance for completing, modifying or deleting the section. They are presented as "Note to Specifier", designated **NTS**.

3. The Division 1 specification sections are standard for all contracts bid by King County. Much of the language within the sections is King County specific. If the Division 1 specifications are used as a template for a contract bid by an agency other than the County, then the King County specific language must be appropriately modified to meet the requirements of that agency.

4. The King County I/I Program Pilot Projects were comprised of sewer rehabilitation work on portions of the system owned and operated by local agency sewer providers that discharge to the regional County sewer system. The local agencies typically had specific requirements regarding issues such as allowable working hours, necessary permits, standards, noise ordinances, etc. The guide specifications include sections noting certain ***Agency*** requirements. These sections need to be tailored to the specific requirements of the municipality or district in which the work is being performed.

TABLE OF CONTENTS
GUIDE SPECIFICATION

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY

A. This Section contains a summary of the work in this Contract and other known work in the vicinity of the Contract work.

1.02 WORK OF THIS CONTRACT

A. The work of this Contract consists of:
   1. ***Inspection and recording of all surface features at the locations of the construction work. Recording shall be by videotaping together with photographs as specified. Videotaping shall include both pre- and post-construction.***
   2. ***Cleaning, refurbishment and repair of approximately 36 sanitary sewer manholes.***
   3. ***The rehabilitation of 9,220 linear feet of existing 8-inch diameter and 160 linear feet of existing 12-inch diameter sewer main with cured-in-place pipe (CIPP) lining or "Fold and Form" pipe lining.***
   4. ***The rehabilitation of 73 service connections (6-inch diameter to 8-inch diameter) with a CIPP product. The reconstruction (dig and replace) of one service connection located approximately 55 feet downstream from Manhole No. 56793 (King County Number).***
   5. ***Cleaning of all the sewer mains prior to any rehabilitation or replacement work.***
   6. ***CCTV inspection of the rehabilitated or replaced sewer main.***
   7. ***Complete restoration of the construction work area including patching the roadway, and all restoration of the private property to the satisfaction of the Owner and private property owner.***

B. Accomplishment of work in the Contract Documents shall meet all requirements and dates specified by Section 01014.

C. The above description is not intended to be complete. The work to be completed is provided for in the Contract Documents. The listing in Paragraph 01010-1.02A is not intended to relieve the Contractor of the responsibility for reading and understanding the Contract Documents.

1.03 OTHER RELATED CONTRACTS

A. Cooperate and coordinate with all agencies, trades, and contractors involved in the execution of other contracts ***near the project site***.

1.04 SPECIFICATION LANGUAGE

A. Specifications are written mostly in imperative and streamlined form. Unless indicated otherwise, this imperative language is directed to the Contractor. Additionally, the words "shall be" shall be included by inference where a colon (:) is used within sentences or phrases.
   1. Examples:
      a. Aggregate: ASTM C33.
      b. Adhesive: spread with notched trowel.

B. Related Sections: Individual Specification sections may include a paragraph entitled "Related Sections". Specification sections are listed within the paragraph to assist the Contractor in locating related work. The list is not necessarily all inclusive. Use all specifications required to complete the work.

C. Meet the following state of Washington legal requirements whenever there is reference to certification of documents by an architect, engineer, land surveyor, or landscape architect,:
   1. Architect: RCW 18.08.420(7), RCW 18.08440(5) WAC 308-12-081.

2. Engineers and land surveyors: RCW 18.43.070, RCW 18.43.130(8)(h), WAC 196-24-095.
3. Landscape architects: RCW 18.96.150.

D. Whenever there is wording stating that an item is “as specified” or “as shown”, the reference is to all Technical Specifications and all Drawings in the Contract Documents. Stating “as specified” or “as shown” does not refer necessarily to a Drawing or Specification, but it refers to either.

E. Unless otherwise indicated, all materials and equipment incorporated into the Work shall be as specified and shall be new and of good quality.

PART 2 PRODUCTS

2.01 SOLE SOURCE PRODUCTS

A. Some of the products to be used for this Contract are specified from a sole manufacturer, and are considered sole source products. The sole source products shall be used as specified, substitutions are not permitted.

B. Sole Source products to be used for this Contract include:
1.
2.
3.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01012

REFERENCE MATERIAL

PART 1 GENERAL

1.01 SUMMARY

A. This Section lists reference documents for the Contract. The documents are available for examination at ***the County's Contracts Counter on the 8th Floor of the Exchange Building, 821 Second Avenue, Seattle, Washington.***

1.02 REFERENCE MATERIAL

A. For the work related to the Contract, the following are considered reference documents:
   1. ***Agency SSES Report.***

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

NTS: THIS SECTION SHOULD BE INSERTED IN THE CONTRACT FOR ALL CONTRACTS GREATER THAN $ 0.5 M.

SECTION 01013

VALUE ENGINEERING

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the Value Engineering Change Proposal (VECP) requirements and limitations on use of VECP.

1.02 VECP DEFINITION

A. A VECP is required to meet all of the following requirements:
   1. Cost saving proposals developed to change the Drawings, Specifications, or other requirements of this Contract.
   2. Involves a change in the specified requirements of the Contract for a series of items. (A change in a product is considered a substitution).
   3. Results in a finished project that complies with the County requirements for the Contract.
   4. Not a change in the Contractor's means and methods of construction unless:
      a. The means and methods are specifically identified in the Contract, or
      b. Permanent items to be installed are effected or changed.
   5. Provides a minimum total VECP savings in excess of $20,000. (This amounts to a minimum of $10,000 to the County after expenses.) If the minimum total savings is not in excess of $20,000, then the VECP will not be considered.
   6. Total Savings includes all of the following:
      a. The total reduction in cost to the Contractor and County supported by an estimate of all effects as a result of the items affected by the VECP.
      b. Estimate to include all Contractor and subcontractor (regardless of tier) labor, material, equipment, overhead, profit, and bonding, and other associated costs such as engineering, Project Representative review, engineering review, other agency review, changes in inspection, life cycle cost, and other costs as appropriate. Identify annual operating costs in this estimate.
   7. Provides for the Contract savings (for the items changed in the Contract) resulting from the VECP to be shared equally between the Contractor and the County..
   8. Maintains or improves the required functions affected by the VECP such as service life, reliability, economy of operation, ease of maintenance, life cycle cost, and necessary features and appearance, and safety standards.
   9. Avoids an extension of the Contract Time, or reduces the Contract Time.

NTS: IF AN ANALYSIS DETERMINES THAT NOTHING IN THE CONTRACT WILL BE SUBJECT TO VECP, USE OTHER SECTION 01013 IN WTD MASTERS. THERE IS A VERSION FOR NO VECP IN THE FILE. WE DO NOT WANT TO BE SILENT ON THE INTENT OF THE USE OF VECPs.

1.03 ITEMS NOT SUBJECT TO VECP

A. Manufactured items and equipment listed elsewhere in the Specifications as being County standards or as listed with no substitutions allowed.

NTS: REVIEW THE REQUIREMENTS OF THE CONTRACT AND PROVIDE A LIST OF THOSE WORK PORTIONS NOT SUBJECT TO VECP.

B. Other portions of the work as listed below.
   1.
   2.

1.04 REQUIREMENTS PRIOR TO SUBMITTAL

A. Meet with the Project Representative for preliminary discussions concerning the VECP concept in order to determine whether the VECP meets the requirements of this Section and if the VECP will be considered by the Project Representative.

B. During the preliminary discussions, the Project Representative may reject a VECP for the convenience of the County without justification.

1.05 SUBMITTAL REQUIREMENTS

A. Clearly define all VECPs including:
   1. The difference between the existing Contract requirements and all VECP changes, and detail the comparative advantages and disadvantages of each.
   2. A detailed cost estimate of the amount of savings allocated to the County and Contractor.
   3. An analysis of the effects the proposed change would have on costs of maintenance and operations.
   4. A dead line of the time by which the VECP must be accepted so as to obtain the maximum price reduction, note any effect upon completion of the work within the Contract Time.
   5. A detailed design of the VECP stamped and signed by a professional engineer licensed in the state of Washington.

1.06 PROJECT REPRESENTATIVE REVIEW AND DISPOSITION OF THE VECP

A. The Project Representative may accept or reject part or all of any VECP by providing written notice thereof. Until such written notice is issued, the Contractor remains obligated to perform in accordance with the terms and conditions of the Contract.

B. The decision of the Project Representative as to acceptance or rejection of any VECP shall be final and cannot be appealed within the provisions of Section 00700.

C. Contractor may withdraw part or all of any VECP at any time prior to acceptance by the County. Such withdrawal shall be made in writing to the Project Representative.

D. Each VECP submitted shall remain valid for a period of 60 days from the date submitted, unless extended by agreement between the Contractor and the Project Representative. If the VECP is withdrawn prior to the expiration of this period, or prior to disposition of the VECP by the Project Representative, whichever is earlier, Contractor shall be liable for the costs incurred by the County in reviewing the withdrawn VECP.

1.07 CONTRACTOR ACKNOWLEDGEMENT OF THE PROJECT REPRESENTATIVE ACCEPTANCE

A. Acknowledge acceptance of all VECPs in writing within seven days after receipt of notice from the Project Representative. A VECP may be withdrawn, fully or partially, within this time.

B. If a VECP that was partially accepted by the Project Representative is withdrawn, County costs for review of the withdrawn items will not be assessed by the County. If the Contractor determines for whatever reason, not to implement an approved and accepted VECP, Contractor shall be liable for the costs incurred by the County in reviewing the VECP.

1.08 ACCEPTANCE OF VECP

A. If a VECP is accepted by the Project Representative and acknowledged by the Contractor:
   1. An equitable adjustment in the Contract Price and in any other affected provisions of the Contract will be made by the County and the Contract modified in accordance with Section 00700.
   2. The Contractor shall provide all redesign required for the VECP including any other items affected by the VECP.
   3. The sharing of savings as stated in this Section shall constitute the sole and entire compensation for acceptance and unrestricted use of the VECP by the County, whether under this Contract or in other uses.

4. The Contractor shall have no further rights and interests in the VECP.
5. The Contractor shall remain obligated to complete the work and to comply with all requirements of the Contract including items noted in any Change Order implementing the VECP.
6. Any and all additional costs, construction, or engineering requirements, and coordination efforts required to implement or accommodate the VECP into the work shall be the responsibility and risk of the Contractor.
7. The Contractor accepts the risk of any unanticipated cost or time which may become evident during implementation of the VECP.
8. The VECP will be processed expeditiously through the RCP process into a Change Order.
9. The County will not be liable for any delay in acting upon any VECP.

1.09 WARRANTY

A. When submitted, the Contractor may only restrict the County's scope of use of any VECP data, by marking it with the following statement:

"This data, furnished pursuant to this paragraph, shall not be duplicated, used, or disclosed, in whole or in part, for any purpose except to evaluate the VECP, unless the VECP is accepted by the County. The restriction does not limit the County's right to use information contained in this data if it is or has been obtained, or is otherwise available, from the Contractor or from another source, without limitations. When the VECP is accepted by the County, the County will have the right to duplicate, use, and disclose any data in any manner and for any purpose whatsoever, and have others do so whether under this or any other County contract."

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

NTS: THIS SECTION SHOULD BE INSERTED IN EACH CONTRACT FOR ALL CONTRACTS GREATER THAN $0.5 MIL

SECTION 01013

VALUE ENGINEERING

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the Value Engineering Change Proposal (VECP) requirements and limitations on use of VECP.

B. No items in the Contract are subject to a VECP.

1.02 VECP DEFINITION

A. A VECP is a cost saving proposals developed by the Contractor to change the Drawings, Specifications, or other requirements of this Contract while maintaining or improving the required functions such as service life, reliability, economy of operation, ease of maintenance, life cycle cost, necessary features and appearance, or safety standards.

NTS: THE REASONING FOR HAVING THIS SECTION IS THAT WE DO NOT WANT TO BE SILENT ON THE INTENT OF THE USE OF VE CP's.

1.03 ITEMS SUBJECT TO VECP

A. No portions of the work in this Contract are eligible for VECP.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

NTS: REFERENCE THIS SECTION IN OTHER SECTIONS AS NECESSARY TO MAKE THE CONTRACTOR AWARE OF REQUIREMENTS FOR WORK SEQUENCE. DO NOT STATE REQUIREMENTS THAT ARE IN THIS SECTION, IN OTHER SECTIONS OF THE CONTRACT. ALL ITEMS DEFINED IN PARAGRAPH 1.01A, SHALL BE EXCLUSIVELY IN THIS SECTION.

NTS: THIS SECTION IS INTENDED TO CONSOLIDATE ALL REQUIREMENTS REGARDING COMPLETION TIME, WORK SEQUENCE, MILESTONES, HOURS OF WORK, CONSTRAINTS, AND LIQUIDATED DAMAGES IN ONE PLACE FOR THE CONTRACTORS TO BE INFORMED. WE DO NOT WANT THE CONTRACTOR'S TO ARGUE THAT IMPORTANT INFORMATION WAS SCATTERED THROUGHOUT THE SPECS, INCLUDING IN PERMITS OR EASEMENTS.

NTS: IF A MAJOR PARAGRAPH IS NOT USED, DO NOT ELIMINATE THE PARAGRAPH; INSTEAD INSERT THE WORDS "NOT USED'.

NTS: ITEMS IN BOLD ITALIC REPRESENT EXAMPLE LANGUAGE. DELETE THE EXAMPLE LANGUAGE AND INSERT INFORMATION SPECIFIC TO THE PROJECT.

SECTION 01014

WORK SEQUENCE

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies completion time, milestones, work sequence, constraints, hours of work, and liquidated damages.

B. Schedule and conduct all work in a manner consistent with the Contract, and comply with the construction schedule, the specific work sequence, Contract milestones and constraints of the work as specified.

C. Plan the sequence of construction to accommodate all Contract requirements.

1.02 COMPLETION TIMES

A. Complete the work within the specified Contract Time in accordance with Section 00700. Achieve Substantial Completion within ***120*** days after the effective date of Notice to Proceed.

B. Achieve Final Acceptance within the specified time stated in the Certificate of Substantial Completion as required by Section 00700.

NTS: VERIFY THAT THE 120 DAYS TO SUBSTANTIAL COMPLETION IS REASONABLE GIVEN THE WORK TO BE PERFORMED ON THE PROJECT

1.03 MILESTONES

NTS: THIS PARAGRAPH SHOULD ONLY BE USED IF THERE ARE SPECIFIC PORTIONS OF THE WORK THAT NEED TO BE COMPLETED AT SPECIFIC TIMES DURING THE COURSE OF THE PROJECT. IF THERE ARE MILESTONES, DAMAGES ASSOCIATED WITH NOT MEETING THE MILESTONES SHOULD BE INCLUDED UNDER DAMAGES IN THIS SECTION.

Not Used.

1.04 WORK SEQUENCE

NTS: SPECIFY ONLY WHEN THE WORK CONTRACTUALLY HAS TO FOLLOW A CERTAIN SUCCESSION. DO NOT SPECIFY MEANS AND METHODS.

A. General sequence of work shall be:

1. ***Contractor shall refurbish and repair the sewer main line prior to the refurbishment or repair of the service connections.***
2. ***Contractor shall refurbish and repair the main line and service connections prior to the refurbishment of upstream and downstream manhole(s).***

1.05 CONSTRAINTS

NTS: USE WHEN WORK IN GENERAL OR SPECIFICALLY NEEDS TO BE RESTRICTED IN ANY MANNER. THIS CAN RELATE TO A SPECIFIC AREA OR TO THE CONTRACT IN GENERAL. A CONSTRAINT RESTRICTS, LIMITS, OR REGULATES THE WORK. WHEN WORKING ON PRIVATE PROPERTY, A CONSTRAINT TO BE LISTED MIGHT INCLUDE HOW LONG AFTER STARTING WORK ON A PROPERTY THAT COMPLETION OF SURFACE RESTORATION MUST BE COMPLETED. ALSO LIST HOW LONG SERVICE CAN BE INTERUPTED FOR INDIVIDUAL SIDE SEWERS.

A. ***Work on Bothell Way shall be limited to the hours of 9:00 AM to 3:00 PM****.*

1.06 HOURS OF WORK

NTS: PROVIDE WORK HOURS FOR EVERY CONTRACT. USING VERIFY HOURS WITH MUNICIPALITY IN WHICH THE WORK IS BEING PERFORMED.

A. Allowable Hours of Work:
   1. ***Monday through Friday: 7:00 AM to 7:00 PM.***
   2. ***Saturday: 9:00 AM to 5:00 PM****.*
   3. ***Sunday and Holidays: No work allowed.***

B. Individual Side Sewer Service Interruption: The maximum time allowed for interruption of service to any individual residential side sewer shall be between the hours of 8:00 AM and 5:00 PM. Interruption shall be limited to a maximum of three occurrences per residence. In the case of failure to perform the work in accordance with this restriction, the Project Representative will make arrangements to provide transportation, accommodations, and meals for the night for the residents of each affected residence, and the costs shall be deducted from the Contractor's progress payments.

C. Contractor shall schedule work or provide for sewer service operations to allow businesses to operate during their normal hours of operation. Contractor to coordinate with businesses and submit data as part of the Sewer Service Interruption Notification Plan in Section 02105-1.04

D. Unless otherwise specified, conform with applicable jurisdictions and other pertinent ordinances regarding limitations on work hours or specific parts of the work. Request work hour variations in writing and obtain written approval from ***the Agency*** and the Project Representative prior to initiating work hours outside of the hours allowed by this Contract.

E. Comply with Section 01062.

F. Submit a schedule of working hours in accordance with Section 00700. Reimburse the costs of County and other regulatory agencies' for all overtime inspection in accordance with Section 00700.

1.07 LIQUIDATED DAMAGES

NTS: WORK WITH COUNTY AND CONSTRUCTION MANAGEMENT TEAM REPRESENTATIVE TO DETERMINE AN APPROPRIATE LIQUIDATED DAMAGES PER DAY FOR SUBSTANTIAL COMPLETION.

A. Liquidated damages for failure to achieve Substantial Completion, as provided in Section 00700, shall be in the amount of $_____ per day.

B. Liquidated damages for failure to achieve Final Acceptance, as provided in Section 00700, shall be in the amount of $100 per day.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SUMMARY

A. Measurement is described under each bid item in Paragraph 01025-1.02.

B. Payment for the various items on the Bidding Schedule, as further specified herein, shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals as necessary to complete the various items of the work all in accordance with the requirements of the Contract Documents, including all appurtenances thereto and including all costs of compliance with the regulations of public agencies having jurisdiction, including safety and health requirements of the Occupational Safety and Health Administration of the U. S. Department of Labor (OSHA) and the Washington Industrial Safety and Health Act (WISHA) Department of Labor and Industries. No separate payment will be made for any item that is not specifically set forth in the Bidding Schedule, and all costs thereof shall be included in the prices named in the Bidding Schedule for the various items of work.

C. Indirect costs, including but not limited to, supervision and overhead, profit, the general conditions specified in the Contract, all shall be allocated to each bid item as applicable for work defined in the bid item. No separate payment will be made to the Contractor for these items.

1.02 BID ITEM MEASUREMENT AND PAYMENT

A. The Bidding Schedule is divided into numerous bid items whose definitions follow. Bid Item Nos. 1 through ***20*** represent the entire scope of work covered by the Contract Documents.

1. Bid Item No. 1 - Mobilization/Demobilization:

a. Measurement shall be per Lump Sum and shall not exceed 5 percent of the total bid price.

b. "Mobilization/Demobilization" shall include the operations associated with moving onto and off the site including the initial setup of construction equipment and facilities prior to the actual start of the Contractor's site work, and dismantling and removal of same upon completion of construction. Payment shall constitute complete compensation for all work, labor, materials, incidentals and equipment for "Mobilization/Demobilization." This bid item shall include, but is not limited to, preconstruction photographs and video recording of surface features, progress schedules and reports, procurement, and contract meetings.

c. For payment purposes, 70 percent of the lump sum amount for this Bid Item shall be allocated for mobilization and 30 percent for demobilization per Section 01310.

2. Bid Item No. 2 - 12-inch Mainline Rehabilitation:

a. Measurement shall be per Linear Foot of 12-inch diameter main line rehabilitation as measured from center of manhole to center of manhole (or end cap).

b. Payment shall constitute complete compensation for all work, labor, materials, equipment and incidentals necessary to provide Cure in Place Pipe (CIPP) in place and approved for use. This bid item shall include, but is not limited to, temporary sewer bypassing, grouting, investigation of laterals as indicated on the Drawings, erosion and sedimentation control, trimming of intruding laterals, root removal, cleaning, surface preparation, service reinstatement, manufacturer's support, testing, site restoration and pre and post construction CCTV inspection.

3. Bid Item No. 3 - 10-inch Mainline Rehabilitation:

a. Measurement shall be per Linear Foot of 10-inch diameter main line rehabilitation as measured from center of manhole to center of manhole.

b. Payment shall constitute complete compensation for all work, labor, materials, equipment and incidentals necessary to provide Cure in Place Pipe (CIPP) in place and approved for use. This bid item shall include, but is not limited to, temporary sewer bypassing, grouting, investigation of laterals as indicated on the Drawings, erosion

and sedimentation control, trimming of intruding laterals, root removal, cleaning, surface preparation, service reinstatement, manufacturer's support, testing, site restoration and pre and post construction CCTV inspection.

4. *Bid Item No. 4 - 8-inch Mainline Rehabilitation:*
   a. *Measurement shall be per Linear Foot of 8-inch diameter main line rehabilitation as measured from center of manhole to center of manhole (or end cap).*
   b. *Payment shall constitute complete compensation for all work, labor, materials, equipment and incidentals necessary to provideCure in Place Pipe (CIPP) in place and approved for use. This bid item shall include, but is not limited to, temporary sewer bypassing, grouting, investigation of laterals as indicated on the Drawings, erosion and sedimentation control, trimming of intruding laterals, root removal, cleaning, surface preparation, service reinstatement, manufacturer's support, testing, site restoration and pre and post construction CCTV inspection.*
5. *Bid Item No. 5 - Service Connection and Lateral Rehabilitation Liner:*
   a. *Measurement shall be per Linear Foot of liner as measured from the centerline of the mainline to the centerline of the terminus of the CIPP liner, as scheduled on the Drawings, for which this work is performed.*
   b. *Payment shall constitute complete compensation for all work, labor, materials, equipment and incidentals necessary for lining of existing 6-inch diameter laterals in place and approved for use. This bid item shall include, but is not limited to, pre-construction pipeline locating, temporary sewer bypassing, surface preparation, root cutting, cleaning, service reinstatement, testing, manufacturer's support, and pre and post construction CCTV inspection.*
6. *Bid Item No. 6 - Service Connection Rehabilitation Liner:*
   a. *Measurement shall be per Each service connection, as scheduled on the Drawings, for which this work is performed.*
   b. *Payment shall constitute complete compensation for all work, labor, materials, equipment, and incidentals necessary for lining of existing service connection. This bid item shall include, but is not limited to, temporary sewer bypassing, grouting, testing, trimming of intruding laterals, root removal, cleaning, surface preparation, service reinstatement, manufacturer's support, and pre and post construction CCTV inspection.*
7. *Bid Item No. 7 - Cleanout, 0 to 8 Foot Depth:*
   a. *Measurement shall be per Each installed cleanout.*
   b. *Payment shall constitute complete compensation for all work, labor, materials, equipment, and incidentals necessary to provide cleanout in place and approved for use. This bid item shall include, but is not limited to, excavation, bedding, backfill, compaction, dewatering, temporary sewer bypassing, erosion and sedimentation control, testing, and site restoration.*
8. *Bid Item No. 8 - Grout Pipe Penetrations in Manhole:*
   a. *Measurement shall be per Each pipe penetration as scheduled on the Drawings, for which this work is performed.*
   b. *Payment shall constitute complete compensation for all work, labor, materials, equipment, and incidentals necessary to provide an injection grout seal for pipes up to and including 12-inches in diameter. This bid item shall include, but is not limited to, surface preparation, drilling of grout holes through the manhole wall, grout injection, sealing holes and temporary sewer bypassing.*
9. *Bid Item No. 9 - Manhole Chimney Interior Coating:*
   a. *Measurement shall be per Each manhole, as scheduled on the Drawings, for which this work is performed.*
   b. *Payment shall constitute complete compensation for all work, labor, materials, equipment, and incidentals necessary for providing an interior chimney coating in place and approved for use. This bid item shall include, but is not limited to, surface preparation, temporary sewer bypassing and testing.*
10. *Bid Item No. 10 - Chemical Grouting:*
    a. *Measurement shall be per Each manhole for which this work is performed.*
    b. *Payment shall constitute complete compensation for all work, labor, materials, equipment, and incidentals necessary to injection grout seal a manhole. This bid item shall include, but is not be limited to, surface preparation, drilling of grout holes into or through the manhole wall, grout injection, grouting pipe penetrations, sealing holes,*

testing, dewatering and temporary sewer bypassing.

11. *Bid Item No. 11 - Manhole Pan:*
    a. *Measurement shall be per Each.*
    b. *Payment shall constitute complete compensation for all work, labor, materials, equipment, and incidentals necessary to provide a pan under the manhole lid.*
12. *Bid Item No. 12 - Traffic Control Measures:*
    a. *Measurement shall be Lump Sum.*
    b. *Payment shall constitute complete compensation for all labor, materials, tools, equipment, and incidentals required to provide all traffic control measures excluding labor for traffic control flaggers. This bid item shall include, but is not limited to, acquiring permits, barricades, cones, signs, and other channelization and warning devices.*
13. *Bid Item No. 13 - Traffic Control Labor:*
    a. *Measurement shall be per Hour.*
    b. *Payment shall constitute complete compensation for all labor required for traffic control flaggers.*
14. *Bid Item No. 14 - Controlled Density Fill (CDF):*
    a. *Measurement shall be per Cubic Yard.*
    b. *Payment shall constitute complete compensation for all labor, tools, materials, equipment, and incidentals required to provide CDF backfill.*
15. *Bid Item No. 15 - Asphalt Pavement Patch:*
    a. *Measurement shall be per Ton of asphalt cement pavement.*
    b. *Payment shall constitute complete compensation for all work, labor, materials, equipment, and incidentals necessary to provide a permanent asphalt pavement patch. This bid item shall include, but is not limited to, final sawcutting, crushed surfacing, asphalt patching, temporary and permanent pavement markings, and temporary pavement patching/plating.*
16. *Bid Item No. 16 - Concrete Sidewalk Panel Replacement:*
    a. *Measurement shall be per Square Yard.*
    b. *Payment shall constitute complete compensation for all work, labor, materials, equipment, and incidentals necessary for sidewalk replacement as required for cleanout installation. This bid item shall include, but is not limited to, crushed surfacing, reinforcement, concrete, forming and finishing, and temporary pavement patching/plating.*
17. *Bid Item No. 17 - Trench Excavation Safety Systems:*
    a. *Measurement shall be per Lump Sum.*
    b. *Payment shall constitute complete compensation for all work, labor, materials, equipment, and incidentals necessary for providing shoring in accordance with federal, state and local safety requirements.*
18. *Bid Item No. 18 - Main Replacement by Pipe Bursting:*
    a. *Measurement shall be per Linear Foot of pipe installed by pipe bursting, as measured from center of manhole to center of manhole.*
    b. *Payment shall constitute complete compensation for all work, labor, materials, equipment, and incidentals necessary for replacement of existing pipe with HDPE pipe installed using pipe bursting techniques. This bid item shall include but is not limited to temporary sewer bypassing, core drilling, manhole replacement, pavement sawcutting, excavation, backfill, compaction, bedding, dewatering, temporary plating, erosion and sedimentation control, service reinstatement, testing, royalties and fees, testing, site restoration and pipeline pre- and post construction CCTV inspection.*
19. *Bid Item No. 19 - Mainline Spot Repair:*
    a. *Measurement shall be per Each mainline spot repair.*
    b. *Payment shall constitute complete compensation for all work, labor, materials, equipment, and incidentals necessary for lining of an 8 linear foot long section of existing pipe using cure in place pipe (CIPP) This bid item shall include, but is not limited to, temporary sewer bypassing, grouting, trimming of intruding laterals, root removal, cleaning, surface preparation, service reinstatement, manufacturer's support and pre and post construction CCTV inspection.*
20. *Bid Item No. 20 - Record Drawings:*
    a. *Measurement shall be per Lump Sum.*
    b. *Payment shall constitute complete compensation for all labor, materials, tools,*

equipment, and incidentals required to provide record drawings. This bid item shall include, but is not limited to, drawings, sketches and permit applications as specified in Section 01720.

B. Payment will be made for work fully completed and accepted by the Project Representative.

1.03 MEASUREMENT OF QUANTITIES

A. In measuring all acceptably complete Bid Items of work, the Project Representative will:
   1. Use United States standard measure.
   2. Make all measurements as described in this section, unless individual Specifications require otherwise.
   3. Follow methods generally recognized as conforming to good engineering practice.
   4. Conform to the usual practice of King County by carrying measurements and computations to the proper significant figure or fraction of units for each item.
   5. Measure horizontally or vertically (unless otherwise specified).

B. The terms listed below shall be defined as follows in all measurements under the Contract:
   1. Cubic Yard (CY) - will be measured by the average-end-area method. All or some computations may be based on ground elevations and/or neat dimensions specified, shown in the Contract Drawings, or as altered by the Project Representative.
   2. Each (EA) - will be measured per each item specified and installed and/or constructed.
   3. Hour (HR) - will be measured per each hour.
   4. Linear Foot (LF) - will be measured parallel to the structure's (i.e., curb, pipe, handrailing, traffic paint, etc.) base or foundation, unless the Contract Specifications or Drawings require otherwise.
   5. Lump Sum (LS) - will be complete payment for the work described for that item in the Contract when used as an item of payment.
   6. Square Yard (SY) - will be a calculation from neat line dimensions.
   7. Ton (Ton) – 2000 pounds.

C. No measurement shall be made for:
   1. Work performed or materials placed outside the lines specified, shown on the Drawings, or set by the Project Representative.
   2. Materials wasted, used, or disposed of in a manner contrary to the contract.
   3. Rejected materials (including those rejected after placement if the rejection resulted from the Contractor’s failure to comply with the contract or manufacturer’s recommendations).
   4. Hauling and disposing of rejected or excess materials.
   5. Material remaining on hand after the work is complete.
   6. Any other work or material contrary to any contract provision.

1.04 RECORDS FOR PAYMENT QUANTITIES

A. Where items are specified to be paid by the cubic yard or ton, the following records shall be kept and submitted to Project Representative:
   1. Trucks will be measured by the Project Representative to determine the capacity of each truck. In lieu of such measurement, the Contractor shall provide written proof of the capacity of each truck.
   2. Trucks shall be clearly numbered or marked.
   3. Tickets shall be prepared in duplicate to accompany each truckload of material delivered to or removed from the job site. The tickets shall contain the truck marking, quantity delivered or removed, and the date and time of delivery or removal.
   4. Pay quantities will be prepared on the basis of these records provided that the materials delivered to or removed from the job site are approved as having been used as specified herein.
   5. Unless otherwise specified, the conversion for imported backfill and crushed surfacing shall be 1.8 tons equal one cubic yard volume.

B. Where items are specified to be paid for by the each, linear foot or pound, the Contractor shall keep records of these quantities for submittal to the Project Representative.

C. Where items are specified to be paid for by the lump sum, the Contractor shall keep records of these

quantities for submittal to the Project Representative.

PART 2 MATERIALS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

NTS: 1. THIS SECTION IS REQUIRED ON ALL CONTRACTS AND MUST BE COMPLETED BY LIZ GASKILL OR ADE FRANKLIN PRIOR TO INCORPORATION INTO THE SPECIFICATIONS.

2. THE REPORTS REFERENCED BELOW ARE COMPLETED BY LIZ GASKILL OR ADE FRANKLIN AND MUST BE IN THE CONTRACTS OFFICE PRIOR TO BID ADVERTISEMENT.

3. IF ASBESTOS OR LEAD IS FOUND IN THE WORK AREA, SPECIFIER MUST WORK WITH LIZ GASKILL OR ADE FRANKLIN TO DETERMINE THE APPROPRIATE CONTRACTOR INVOLVEMENT IN THE ABATEMENT. IF IT IS DETERMINED THAT THE CONTRACTOR IS TO BE INVOLVED IN THE ABATEMENT, THAT MUST BE ANNOTATED IN SECTION 01010 AND THE REPORT MUST BE PART OF THIS SECTION.

SECTION 01035

ASBESTOS AND LEAD INFORMATION

PART 1 GENERAL

1.01 SUMMARY

A. This Section provides information pursuant to 29 CFR 1926.1101, WAC 296-62-077, and to all other applicable requirements concerning reporting on asbestos and lead containing materials.

B. The information in this Section is based on the results of a good faith review of the Contract Documents for Contract ***(INSERT CONTRACT #)*** and a site inspection of the proposed work areas to determine the presence of asbestos or lead containing materials. This review and inspection were performed by King County's AHERA Certified Building Inspector in strict accordance with 29 CFR 1926, WAC 296-62-077, WAC 296-155-176, and with the accepted principles and protocol mandated by AHERA.

C. Notify all employees and subcontractors who work or perform work subject to this Section of the contents of this Section.

1.02 QUALITY ASSURANCE

A. Referenced Standards: This Section incorporates by reference the latest revisions of the following documents. They are part of this Section insofar as specified and modified herein. In case of conflict between the requirements of this Section and the listed documents, the requirements of this Section shall prevail.

Reference	Title
AHERA	(Federal) Asbestos Hazard Emergency Response Act
29 CFR 1926.1101	Safety and Health Regulations for Construction: Asbestos
WAC 296-62-077	Occupational Health Standards: Asbestos, Tremolite, Anthrophyllite and Actinolite
Chapter 296-65 WAC	WISHA Asbestos Standards
WAC 296-155-176	Safety Standards for Construction Work - Lead

1.03 ASBESTOS INSPECTION

A. The County's Inspector has determined to the best of its ability that the proposed construction areas under this Contract and the materials therein, do /do not contain asbestos.

NTS: EDIT THE ABOVE PARAGRAPH BY DELETING "DO" OR "DO NOT" AS APPLICABLE.

B. A copy of the report documenting the review and inspection and the findings is available for review at the Contracts Counter, 8th Floor, Exchange Building, 821 Second Avenue, Seattle, Washington, 98104.

1.04 LEAD INSPECTION

A. The County's Inspector has determined to the best of its ability that the proposed construction areas under this Contract and the materials therein, do/do not contain lead.

NTS: EDIT THE ABOVE PARAGRAPH BY DELETING "DO" OR "DO NOT" AS APPLICABLE.

B. A copy of the report documenting the review and inspection and the findings is available for review at the Contracts Counter, 8th Floor, Exchange Building, 821 Second Avenue, Seattle, Washington, 98104.

1.05 CONTRACTOR'S RESPONSIBILITIES

A. Should suspect material not identified in this Section be encountered, immediately suspend all work that could disturb said material and notify the Project Representative who will implement the proper action. Do not proceed with work that could disturb the material until authorized by the Project Representative, in writing, to do so.

NTS: IF THE MATERIALS DO CONTAIN LEAD, INCLUDE THE FOLLOWING PARAGRAPH B.

B. Take the necessary precautions for compliance with WAC 296-155-176. Submit an abatement and disposal plan for review and approval by the Project Representative.

1.06 COUNTY'S RESPONSIBILITIES

A. Upon notification by the Contractor of the existence of suspect material not identified in this Section, the Project Representative will have said material inspected and analyzed for the presence of asbestos or lead, as required. The inspection and analytical work will meet the requirements specified under either Paragraph 01035-1.03 or -1.04 above, as may be applicable.

B. If the results of the inspection and analysis confirm the presence of asbestos in the suspect material, the County will take the necessary actions for compliance with 29 CFR 1926.1101. After compliance is obtained, the Project Representative will notify the Contractor in writing so that work suspended per Paragraph 01035-1.05 can proceed.

C. If the results of the inspection and analysis confirm the presence of lead in the suspect material, the County will take the necessary actions for compliance with WAC 296-155-176. After compliance is obtained, the Project Representative will notify the Contractor in writing so that work under this Contract can proceed.

D. If the results of the inspection and analysis confirm that the suspect material is free of asbestos and lead, the Project Representative will notify the Contractor in writing so that work suspended per Paragraph 01035-1.05 can proceed.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

NTS: THIS SECTION IS REQUIRED ON ALL CONTRACTS EVEN IF NO PERMITS OR EASEMENTS ARE TO BE OBTAINED BY THE COUNTY. THE ASSUMPTION SHOULD NOT BE MADE THAT NO PERMITS ARE REQUIRED BY THE CONTRACTOR.

NTS: ASSURE THAT ALL THE TERMS AND CONDITIONS OF THE PERMITS AND EASEMENTS ARE CLEAR TO THE CONTRACTOR AND DELINEATE THE RESPONSIBILITY FOR MEETING THE REQUIREMENTS OF EACH PERMIT AND EASEMENT. ASSURE THAT PERMITTING/RIGHT-OF-WAY HAS REVIEWED THIS SECTION.

SECTION 01062

PERMITS AND EASEMENTS

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies permit and easement acquisition, requirements, and conditions.

1.02 PERMITS

A. The County has acquired the following permits:
1.

NTS: INSERT NAMES OF ALL PERMITS OBTAINED BY THE COUNTY.

B. Copies of the permits obtained by the County are included in Attachment A to this Section. Unless otherwise indicated, comply and be responsible for all terms and conditions and permit requirements contained in such permits.

C. Permits to be received by the County not listed in Paragraph 01062-1.02A:
1.

NTS: LIST ANY OUTSTANDING PERMITS THAT WILL BE ACQUIRED BEFORE THE START OF CONSTRUCTION.

D. Permit milestones: ***Section 01014.***

1.03 EASEMENTS

A. The County has acquired the following easements:
1. ***No easements have been acquired.***

B. Easement milestones: ***Section 01014.***

C. ***Portions of the project are located on existing easements. Coordinate access to manholes on easements with the property owner and the Project Representative. See 01062-1.04 for rights-of-entry for easement access from private properties. Difficulties or ease of access shall be included in the individual contract bid items. Bid item quantities may be reduced if in the opinion of the Project Representative that access is unobtainable, thereby preventing performance of portions of the work required under this contract.***

1.04 RIGHTS-OF-ENTRY

A. The County has acquired or is in the process of acquiring right-of-entry for access to the work from private property. A list of the properties for which rights-of-entry have been acquired

and properties for which acquisition of right-of-entry is pending is included in Attachment B to this Section.

B. Copies of the rights-of-entry terms and conditions are included in Attachment B to this Section. Unless otherwise indicated, comply with applicable terms and conditions contained in such rights-of-entry.

1.05 PERMITS AND EASEMENTS OBTAINED BY CONTRACTOR

A. Be responsible for and obtain all other permits and easements required to perform the work not listed in Paragraphs 01062-1.02 and 1.03 in accordance with Section 00700.

B. Prepare and submit to the proper authority, all information required for the issuance of such permits or easements. Pay all costs thereof including agency inspections and easement costs unless specifically provided otherwise in the Contract. Comply with all terms and conditions and permit requirements contained in such permits.

C. Provide a copy of each permit and easement to the Project Representative prior to pursuing any work covered by the permit or easement.

D. When required by the permit and during work progress covered by the permit, the work shall be inspected by the issuing agency.

E. Provide a copy of the completed permit with the issuing agency acceptance or easement owner release.

F. ***Agency Business License.***

1.06 SUBMITTALS

A. Procedures: Section 01300.

B. Permits and easements obtained by the Contractor.

C. Approvals when work is complete for permits obtained by the Contractor.

D. Easement and right-of-entry releases.

1.07 POSTING PERMITS AND EASEMENTS

A. Permits and easements, including those obtained by the Contractor, shall be posted at the site of the work.

1.08 CONSTRUCTION RESTORATION ACCEPTANCE FORM

A. Whenever work is performed on property other than street right-of-way, obtain signature on a Construction Restoration Acceptance Form (see sample form in Section 01999) from the property owner or property owner's agent for each property, parcel, or area certifying that the restoration of structures and/or surfaces has been completed to the satisfaction of the property owner, and that the property owner has no claims for damages on account of such restoration. Provide signed form to the Project Representative.

B. Restoration acceptance shall comply with the requirements as set forth in the Construction Restoration Acceptance Form. If, in the opinion of the Project Representative, the restoration acceptance is unreasonably withheld by the property owner, the County may, at its sole discretion, not require the restoration acceptance to be completed.

NTS: COMPLETING ALL RESTORATION ACCEPTANCE FORMS FOR PROJECTS ON PRIVATE PROPERTY CAN BE VERY DIFFICULT AND TIME CONSUMING. OTHER APPROACHES MAY

BE EXPLORED DURING NEGOTIATION OF RIGHT-OF-ENTRY WITH INDIVIDUAL PROPERTY OWNERS.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

ATTACHMENT A

PERMITS

ATTACHMENT B

RIGHTS-OF-ENTRY

NTS: THIS IS THE MOST RECENT VERSION OF SECTION 01063. WE ARE IN THE PROCESS OF WORKING WITH PCSS TO GET THE APP SUBMITTED AS PART OF THE BID EVALUATION PROCESS. THIS SECTION REFLECTS THIS CHANGE. IF YOU HAVE A CONTRACT THAT WILL BE BID AFTER MARCH 15, 2001, THEN IT NEEDS TO HAVE THE NEW SECTION 01063 IN IT FOR IMPLEMENTATION

NTS: THIS SECTION SHALL NOT CHANGE. ANY QUESTIONS REGARDING THIS SECTION IN REFERENCE TO A SPECIFIC CONTRACT SHALL BE ADDRESSED WITH WYATT WOOD, CONSTRUCTION SAFETY.

NTS: IF THE PROPOSED CONTRACT CONTAINS WORK WHICH YOU BELIEVE IS NOT COVERED IN THIS SPECIFICATION, REVIEW PROPOSED LANGUAGE WITH WYATT WOOD OR JIM FACCONE.

NTS: THIS SECTION REQUIRES ADDITIONAL REQUIREMENTS IF THE CONTRACT IS FOR HAZARDOUS MATERIALS HANDLING. SEE JIM FACCONE FOR FURTHER REQUIREMENTS.

SECTION 01063

HEALTH AND SAFETY

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies procedures for complying with applicable laws and regulations related to worker safety and health. It is not the intent of the County to develop, manage, direct, and/or administer the safety and health programs of contractors or in any way assume the responsibility for the safety and health of their employees. It is required that all Contractors adhere to applicable federal, state and local safety and health standards.

B. This Section describes the requirements for submittal of the Contractor's Site Specific Health and Safety Plan (HASP).

C. Implement the Accident Prevention Program (APP) submitted per Section 00440 and accepted at the conclusion of the bid evaluation.

D. It is not the intent of the County Wastewater Treatment Division (WTD) to list and identify all applicable safety codes, standards, and/or regulations requiring compliance by all contractor and subcontractor groups. Contractor and subcontractors shall be solely responsible for identifying and determining all safety codes, standards, and regulations which are applicable to the work.

E. Contractor and subcontractors are encouraged to use the consulting services of the State of Washington's Department of Labor and Industries WISHA Consulting Section at (206) 281-5470, for assistance with the requirements of this Section.

F. The HASP submittal shall be accepted and implementable per Section 01300 requirements prior to the start of site work.

NTS: THE HASP SHALL BE SUBMITTED FOR THE WORK ORDER SCOPE. EACH WORK ORDER SHALL BE EVALUATED TO DETERMINE IF ADDITIONAL HASP MATERIAL IS REQUIRED TO BE SUBMITTED FOR THE WORK SCOPE.

G. All work required in the Contract shall meet the requirements in RCW 49.17 and 29 CFR 1926 and be considered in the bid amount per RCW 39.04.180.

1.02 QUALITY ASSURANCE

A. Referenced Standards: This Section incorporates by reference the latest revision of the following document. It is a part of this Section as specified and modified. In case of conflict between the requirements of this Section and that of the listed document, the requirements of this Section shall prevail.

Reference	Title
29 USC 651 et seq.	Federal Occupational Safety and Health Act
29 CFR 1910.146	Permit Required Confined Spaces
29 CFR 1910.147	Control of Hazardous Energy (lockout/tagout)
29 CFR 1926	Safety and Health Regulations for Construction
Chapter 296-24 WAC	WISHA General Safety and Health Standards
Chapter 296-37 WAC	WISHA Safety Standards for Commercial Diving
Chapter 296-45 WAC	WISHA Electrical Workers Safety Rules
Chapter 296-62 WAC	WISHA General Occupational Health Standards
Chapter 296-67 WAC	WISHA Process Safety Management Standards
Chapter 296-800 WAC	Safety and Health Core Rules
RCW 49.17	Washington Industrial Safety and Health Act (WISHA)
RCW 39.04.180	Trench Safety Systems, Safety Systems Required
WAC 296-800-110	Employer responsibilities: Safe workplace -- Summary

1.03 SUBMITTALS

A. Procedures: Section 01300.

B. HASP:
1. Submit Contractor HASP for all Contract work for review and disposition.
2. After submittal receives a disposition allowing implementation, submit three copies.

NTS: IN CASES OF A LONGER TERM CONTRACTS(AS A GUIDELINE, GREATER THAN ONE YEAR), THE HASP MAY BE ABLE TO BE SUBMITTED FOR LATER WORK IN A STAGED SUBMITTAL. IF THIS IS THE SITUATION, DETERMINE WHAT MAY BE SUBMITTED AT A LATER DATE, STIPULATE IN THIS SECTION WHEN THE SUBMITTAL IS REQUIRED, AND MEET WITH WYATT WOOD FOR HIS COMMENTS AND CONCURRENCE PRIOR TO IMPLEMENTING THIS PROVISION.

C. APP: Provide four copies within five days of the effective date of the NTP.

D. Revised APP and HASP accommodating changes requested by the Project Representative and/or regulatory agencies or jurisdiction per Paragraph 01063-3.02. Provide four copies.

E. Incident Report(s): Provide four copies.

F. Minutes and list of attendees of the pre-job safety meeting: Provide four copies within three days of the meeting.

G. Minutes and list of attendees of weekly safety tailgate meeting: Provide four copies within three days of the meeting.

H. Monthly Contractor Injury Summary Report: provide four copies each month on Form 01063-A received from Project Representative within ten days of the end of each month.

I. Notice and listing of flammable liquids and liquefied petroleum gases when planned to be used on the work site.

1.04 CONTRACTOR QUALITY ASSURANCE

A. Review the entire scope of work, the work site location, adjacent structures and systems, and applicable Contract requirements to ensure, by personal review and examination, and by such other

means as appropriate, the safety considerations and requirements that shall be addressed and planned prior to the start of work.

B. Ensure that Contractor's employees and the subcontractor's employees comply with the APP and HASP.

C. Designate a health and safety supervisor on site with appropriate training, responsibility and full authority to coordinate, implement, and enforce the Contractor's APP and HASP for the duration of this Contract. The name and telephone number of the health and safety supervisor and alternate shall appear in the APP and HASP.

D. Ensure that safe work principles and practices are followed in completing work tasks.

1.05 HASP

A. A comprehensive HASP covers all aspects of the Contractor's work activities related specifically and distinctly to the work and site conditions. The HASP shall be based on a site specific hazard analysis and shall explain how the APP elements and any Contract specific safety procedures shall be applied to the identified hazards in the work.

B. HASP organization: organized and bound to readily accept revisions and additions.
   1. Outline form.
   2. Table of contents.

C. The following subparagraphs describe certain minimum precautions for consideration in developing an APP and HASP. Include in the HASP all of the items below which may apply to the work. There may be other items not noted below which the Contractor shall address in the HASP. Items below which are not needed, note in the HASP as not applicable.
   1. Hazard Communication (WAC 296-62 Part C):
      a. Contaminant gases that may be encountered include, but are not limited to, hydrogen sulfide, methane, carbon monoxide, carbon dioxide and sulfur dioxide.
      b. Provide a written Hazard Communication Program and emergency management plan addressing these and other potential hazardous substances that may exist and/or be brought on site during the work.
      c. For work requiring the use of hazardous materials and chemicals, provide a list and corresponding Material Safety Data Sheets (MSDS) for hazardous chemicals to be used on site. If no hazardous chemicals are to be used, provide statement to that effect.
   2. Confined Space (WAC 296-62 Part M):
      a. The nature of the work may expose workers to permit-required confined spaces having possible explosive, toxic and oxygen deficient atmospheric conditions.
      b. Prior to execution of work in confined spaces. Provide a written Permit Required Confined Space Safety Program that meets the requirements of 29 CFR 1910.146 and WAC 296-62 Part M.
   3. Hazardous Energy Control:
      a. The nature of the work may expose workers to hazardous energy sources that include, but are not limited to, electrical, mechanical, pneumatic, hydraulic, thermal, and computerized systems. Provide a written plan outlining safe work practices addressing hazardous energy control procedures that meet the requirements of 29 CFR 1910.147 and WAC 296-24 Part A-4.
      b. Lockout/Tagout (WAC 296-24 Part A-4):
         1) In the written plan outlined above, address the Lockout/Tagout procedures that meet the requirements of 29 CFR 1910.147 and WAC 296-24 Part A-4. The written plan is to be coordinated and be compatible with the County's existing program for Lockout/Tagout.
   4. Fall Prevention and Protection (WAC 296-24 Part J-1) and WAC 296-155 Part C-1):
      a. The nature of the work may expose workers to fall hazards.
      b. Provide a written Fall Prevention and Protection plan outlining safe work practices addressing fall hazards that meet the requirements of WAC 296-24 Part J-1 and WAC 296-155 Part C-1.

5. Personal Protective Equipment (WAC 296-24 Part A-2):
   a. The nature of the work may expose workers to miscellaneous injury hazards to the head, hands, feet, body, eyes, ears, etc.
   b. Provide a written Personal Protective Equipment (PPE) plan outlining safe work practices addressing the use of personal protective equipment and clothing that meet the requirements of WAC 296-24 Part A-2.
6. Underground Construction (WAC 296-155 Part Q):
   a. Provide a written program detailing how employees and County staff on the site will be protected from the dangers of underground construction. As a minimum, the program shall include the following where applicable to the work:

Air Monitoring	Emergency Procedures, including evacuation procedures and Check-in/check-out systems
Ventilation	Hazardous classification
Illumination	Haulage
Communications	Electrical safety
Flood control	Hoisting
Mechanical equipment	Designated person
PPE	Emergency lighting
Use of explosives	Ground support
Fire prevention and protection	Pneumatic and hydraulic safety
Access and egress	Rescue

7. Biological Agents (WAC 296-62 Part J):
   a. Wastewater systems carry a wide spectrum of disease-producing organisms.
   b. Provide a written hazard communication and biological/bloodborne pathogen program detailing the preventive measures to be taken to provide an appropriate work environment for all site employees as well as County staff on site. These may include, but are not limited to, the following:
      1) Instruction in appropriate measures to avoid contamination.
      2) A preventative inoculation program (tetanus/diphtheria, etc.) available to all employees.
      3) Personal protective equipment and clothing to protect against infection, including rubber boots with full sole and heel steel insert-liners, safety glasses or goggles, and gloves.
      4) Facilities for workers to clean up, wash, and maintain good personal hygiene practices.
8. Process Safety Management (Chapter 296-67 WAC):
   a. The County uses chlorine (as a disinfectant), sulfur dioxide (for dechlorination) and propane, and generates digester gas (methane) at the wastewater treatment plants. Chlorine and sulfur dioxide in small concentrations can cause irritation or burning of skin, coughing, pulmonary edema, and inflammation of the respiratory tract; in greater concentrations, they can cause cardiac complications.
   b. At a minimum, provide a written Hazard Communication Program detailing the preventive measures to be taken to provide an appropriate work environment for its employees as well as County staff on site. Where Contractor's work involves modifications to the chlorine, sulfur dioxide, propane, and/or digester gas systems, provide a detailed Management of Change (WAC 296-67-045).

NTS: WHEN THE WORK INVOLVES PROCESS SAFETY, IT IS REQUIRED IN SELECTING A CONTRACTOR, TO OBTAIN AND EVALUATE INFORMATION REGARDING CONTRACTOR'S SAFETY PERFORMANCE AND PROGRAMS. THIS SHALL BE PART OF SECTION 00440, QUALIFICATIONS.

9. Hot Work and Hot Work Permits (HWP):
   a. Identifies any type of work that produces a possible source of ignition in the presence of a fuel and oxygen (Fire Triangle) including, but will not be limited to, sparks, static electricity, welding, torch cutting, flame heating, brazing, grinding, sanding, and drilling. These activities are considered to be extremely dangerous in areas where the potential for an Lower Explosive Limit (LEL) above 10% or oxygen enriched atmosphere could be encountered and/or where the hot work would be in close proximity to combustibles or flammables. Permit-required confined spaces, underground construction, plant areas, and systems

covered under Process Safety Management (PSM) requirements and/or other applicable system areas where the mixture of an ignition source, fuel and oxygen is possible, require HWPs to be used when hot work is performed in these areas.

b. HWPs: utilized in all WTD facilities and construction sites where the potential for the ignition of explosive gases, liquids and/or flammable/ combustible materials or oxygen enriched atmospheres may potentially exist.

c. HWPs required for areas that are classified per the WAC and NFPA 820, as applicable.
   1) Permit-Required Confined Spaces.
   2) Process Safety Management System Areas.
   3) Class 1 Division 1/Division 2 hazardous locations.
   4) All other areas where the hot work would be in close proximity to combustibles or flammables.

d. WTD HWP: obtained from the County prior to the start of all Hot Work in County facilities. The HWP provides written authorization to perform Hot Work operations and establishes conditions necessary to perform these operations. Request a WTD HWP from the Project representative a minimum seven days prior to use.

e. Contractor HWP: for all sites under Contractor control. Annotate how Contractor HWP is established and employ a system for issuing HWPs and monitoring their use.

f. HWPs are valid only for the parties performing the work, the work shift during which the work is conducted, and only for the conditions observed and evaluated when the permit is issued.

10. Suspect Material:
    a. Promptly suspend work and notify the Project Representative of unusual conditions, including oily soil found on work site. Work shall remain suspended until authorized in writing by the Project Representative to resume.
11. Commercial Diving Operations (Chapter 296-37 WAC):
    a. Due to the hazards associated with commercial diving operations conducted within wastewater collection, conveyance and treatment facility systems, specific safety protocols and procedures are required to ensure worker and diver safety.
    b. Provide a comprehensive Safe Practices Manual for Diving Operations which complies with Chapter 296-37 WAC.
12. Undeterminable Injuries:
    a. Certain types of incidents may result in injuries to an employee that are not immediately apparent, but which could impair the employee's ability to perform work safely. Describe your procedure for determining if an employee with an undeterminable injury may safely work on the work site.
13. Flammable Liquids and Liquified Petroleum Gases (LPG):
    a. No propane, propylene, butane, isobutane, and butylenes shall be stored inside buildings.
    b. Provide a written listing of each of the materials listed in Paragraph 01063-1.05C.13a planned to be used on site.
    c. When materials listed in Paragraph 01063-1.05C.13a are to be used on the work site, submit listing of the materials and notice prior to arrival on the work site.

1.06 UTILITIES

A. During the performance of the work, take appropriate precautions when working near, around, and/or with utilities and dangerous substances, in order to protect the health and safety of the worker, the public, property, and the environment.

B. Provide a flagged warning line for all work conducted in proximity to power lines. Coordinate with utility owner for this work.

C. Coordinate with the utility owner and the Project Representative to obtain approval to disconnect or reconnect utilities.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 SAFETY AND HEALTH COMPLIANCE

A. The Project Representative reserves the right to audit the Contractor's APP and implementation of HASP. The Project Representative reserves the right to stop that portion of the Contractor's work that is determined to be an imminent or immediate threat to worker health or safety. Ongoing work and hazardous situations that are considered a safety or health risk by the Project Representative shall be corrected immediately.

B. Ensure that necessary air monitoring, ventilation equipment, protective clothing, hazardous energy control devices, fall prevention and other specified supplies and equipment are made readily available to employees to facilitate implementation of the APP and the HASP.

C. All County facility entry protocols shall be followed. Enter all County facilities in teams of two or more. With written approval of the Project Representative, Contractor employees may enter alone only for short-term walk through inspections that do not involve working on ladders, with electrical equipment, or entering confined spaces. Any work beyond short term work which involves Contractor employees working alone requires written approval of the Project Representative.

D. Notify the Project Representative immediately of all incidents involving personal injury and/or property damage. Provide a written report known as the Incident Report within 24 hours of any incident. Report for each incident occurrence shall include:
   1. Description of event.
   2. Names of personnel involved.
   3. Description of injuries and treatment required (short term and long term).
   4. Description of property damage.
   5. Site visits and inspections of other agencies as a result of an incident. Include names of the persons, purpose of the visit, and any other pertinent information.

E. Conduct a pre-job safety meeting with Contractor staff and with all subcontractor staff. Submit list of attendees and minutes of pre-job safety meeting.

F. Conduct all weekly safety tailgate meetings. Submit list of attendees and minutes of weekly safety tailgate meetings.

G. Submit a Monthly Contractor Injury Report on Form 01063-A in Section 01999 consisting of a summary of the current month's injury accidents.

H. Use of intoxicants or of illegal or debilitating drugs while working on a County contract is prohibited.

I. Failure to comply with safety and health regulations will result in work suspension until adequate safety and health measures are implemented.

3.02 SITE SPECIFIC HEALTH AND SAFETY PLAN REVISIONS

A. In the event that the Project Representative, regulatory agencies, or jurisdictions determine that the HASP or associated documents, or organizational structure to be inadequate to protect employees and the public:
   1. Modify the APP and HASP to meet the requirements of said regulatory agencies, jurisdictions, and/or the Project Representative.
   2. Provide submittal for revisions to the APP and HASP within 7 days of the notice of requirement for modification.
   3. The revision shall be approved by the Project Representative prior to changing work practices.

3.03 POSTING

A. Provide and maintain a copy of the accepted APP and the HASP at the Contractor's job site office and at each of the subcontractors' offices.

3.04 COMPLIANCE

A. Failure to comply with this Section will result in work suspension until adequate safety and health measures are implemented.

END OF SECTION

SECTION 01065

NOTIFICATION AND RELATIONS WITH RESIDENTS AND PUBLIC

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies notification requirements and responsibilities of the Contractor in regard to relations with businesses, residents and the general public.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 01570: Traffic Regulation.
   2. Section 02105: Sewer Bypassing.

1.02 NOTIFICATION PROVIDED BY PROJECT REPRESENTATIVE

A. The Project Representative will provide several public notifications informing affected businesses and residents of project timing and the general scope of work to be performed in the neighborhood. Work schedule on private property and affecting businesses and multi-family buildings will be provided by the Contractor to the Project Representative for inclusion in the notifications.

1.03 NOTIFICATION PROVIDED BY CONTRACTOR

A. Construction Activity Affecting Businesses, Multi-Family Buildings and Single Family Homes: For each property, the Contractor shall take the following actions prior to and during construction:
   1. Submit Traffic Control Notification Plan per Section 01570.
   2. Submit Sewer Service Interruption Notification Plan per Section 02105.
   3. Forty-eight (48) hours notice by door hanger to be provided to the Contractor by the Project Representative and hung by the Contractor.
   4. The Contractor shall make a minimum of two attempts to contact the property owner in person and to explain specifically what will be done. If the Contractor is unsuccessful, he shall contact the Project Representative for direction on how to proceed.
   5. In all cases, the Contractor shall obtain specific direction for each property from the Project Representative prior to performing construction activity on the property.
   6. The Contractor shall provide the Project Representative with a detailed sketch showing sewer bypass method and routing of bypass piping for service connections a minimum of 5 working days prior to construction activities.

1.04 RELATIONS WITH THE PUBLIC

A. The Project Representative shall be the public relations contact.

1.05 NOTIFICATION OF RESIDENTS FOLLOWING RESTORATION

A. The Contractor shall hang a door hanger to be provided by the Project Representative on each business or residence immediately following completion of construction. Such door hanger will state that the Contractor has completed construction and that any new landscaping is now the responsibility of the property owner.

PART 2 MATERIALS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01090

REFERENCE STANDARDS

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies reference standards abbreviation and other acronyms to assist the Contractor.

1.02 QUALITY ASSURANCE

A. For products or workmanship specified by association, trade, or federal standards, comply with requirements of the standard, except when more rigid requirements are required by applicable codes or specified herein.

B. Comply with referenced standards that are current at the date of receipt of bids.

C. The contractual relationship of the Contracted parties shall not be altered by mention or inference otherwise in any reference document.

NTS: CHECK THE BELOW LIST OF REFERENCES TO ENSURE ALL REFERENCED ORGANIZATIONS IN THE SPECIFICATIONS ARE LISTED IN THIS SECTION.

1.03 REFERENCED STANDARDS

AA	Aluminum Association (www.aluminum.org)
AABC	Associated Air Balance Council (www.aabchq.com)
AAMA	American Architectural Manufacturers Association (www.aamanet.org)
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials (www.asshto.org)
AATCC	American Association of Textile Chemists and Colorists (www.aatcc.org)
ABMA	American Bearing Manufacturers Association (www.abma-dc.org)
ABMA	American Boiler Manufacturers Association (www.abma.com)
ACCA	Air Conditioning Contractors of America (www.acca.org)
ACI	American Concrete Institute (www.aci-int.org)
ACPA	American Concrete Pipe Association (www.concrete-pipe.org)
ACPPA	Asbestos Cement Pipe Producers Association (www.asbestos-institute.ca/pvc.html)
ADC	Air Diffusion Council (www.flexibleduct.org)
AEIC	Association of Edison Illuminating Companies (www.aeic.org)
AGA	American Gas Association (www.aga.org)
AGMA	American Gear Manufacturer's Association (www.agma.org)
AI	Asphalt Institute (www.asphaltinstitute.org)
AISC	American Institute of Steel Construction (www.aisc.org)
AISE	Association of Iron and Steel Engineers (www.aise.org)
AISI	American Iron and Steel Institute (www.steel.org)
AITC	American Institute of Timber Construction (www.aitc-glulam.org)
AMCA	Air Movement and Control Association (www.amca.org)
ANLA	American Nursery and Landscape Association (www.anla.org)
ANSI	American National Standards Institute (www.ansi.org)
APA	The Engineered Wood Association (www.apawood.org)
API	American Petroleum Institute (www.api.org)
APWA	American Public Works Association (www.apwa.net)
AREMA	American Railway Engineering and Maintenance-of-way Association (www.arema.org)
ARI	Air Conditioning and Refrigeration Institute (www.ari.org)
ASA	Acoustical Society of America (asa.aip.org)

ASCE	American Society of Civil Engineers (www.asce.org)
ASE	American Standard Safety Code for Elevators and Escalators
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers (www.ashrae.org)
ASME	American Society of Mechanical Engineers (www.asme.org)
ASNT	American Society for Nondestructive Testing (www.asnt.org)
ASQ	American Society for Quality (www.asq.org)
ASSE	American Society of Sanitary Engineering (www.asse-plumbing.org)
ASTM	American Society for Testing and Materials (www.astm.org)
AWI	Architectural Woodwork Institute (www.awinet.org)
AWPA	American Wood Preservers Association (www.awpa.com)
AWS	American Welding Society (www.amweld.org)
AWWA	American Water Works Association (www.awwa.org)
BHMA	Builders Hardware Manufacturers Association (www.buildershardware.com)
BIA	Brick Institute of America (www.bia.org)
BOCA	Building Officials and Code Administrators International (www.bocai.org)
BOR	Bureau of Reclamation (www.usbr.gov)
CABO	Council of American Building Officials (www.bocai.org)
CEMA	Conveyor Equipment Manufacturers Association (www.cemanet.org)
CGA	Compressed Gas Association (www.cganet.com)
CI	Chlorine Institute (www.cl2.com)
CISPI	Cast Iron Soil Pipe Institute (www.cispi.org)
CLFMI	Chain Link Fence Manufacturers Institute (www.chainlinkinfo.org)
CMAA	Crane Manufacturers Association of America (www.mhia.org/cmaa)
COE	Corps of Engineers (www.usace.army.mil)
CPSC	Consumer Product Safety Commission (www.cpsc.gov)
CRA	California Redwood Association (www.calredwood.org)
CRD	Corps of Engineers Specification
CRSI	Concrete Reinforcing Steel Institute (www.crsi.org)
CEMA	Conveyor Manufacturers Association (222.cemanet.org)
CRI TM	Carpet and Rug Institute (www.carpet-rug.com)
CSA	Canadian Standards Association (www.csa.ca)
CTI	Cooling Technology Institute (www.cti.org)
CWHSSA	Contract Work Hours & Safety Standards Act
DASMA	Door and Access System Manufacturers Association (www.taol.com/dasma)
DHI	Door and Hardware Institute (www.dhi.org)
DIPRA	Ductile Iron Pipe Research Association (www.dipra.org)
DOE	Department of Ecology (www.ecy.wa.gov)
EEI	Edison Electric Institute (www.eei.org)
EIA	Electronic Industries Association (www.eia.org)
EIMA	EIFS Industry Members Association (www.eifsfacts.com)
EJMA	Expansion Joint Manufacturers Association (www.ejma.org)
EPA	United States Environmental Protection Agency (www.epa.gov)
FS	Federal Specifications (www.fss.gsa.gov/pub/fed-specs.cfm)
FED-STD	Federal Standards (www.fss.gsa.gov/pub/fed-specs.cfm)
FHWA	Federal Highway Administration (www.fhwa.dot.gov)
FM	Factory Mutual Engineering and Research (www.fmglobal.com)
FS	Federal Specifications
FSUP	Forestry Suppliers (www.forestry-suppliers.com)
FCCCHR	Foundation for Cross-Connection Control and Hydraulic Research (www.usc.edu/dept/fccchr/)
GA	Gypsum Association (www.gypsum.org)
GANA	Glass Association of North America (www.glasswebsite.com)
GSI	Geosynthetic Institute (www.geosynthetic-institute.org)
HEI	Heat Exchange Institute (www.heatexchange.org)
HI	Hydraulic Institute (www.pumps.org)
HMI	Hoist Manufacturer's Institute (www.mhia.org)
HPVA	Hardwood Plywood and veneer Association (www.hpva.org)
IAPMO	International Association of Plumbing and Mechanical Officials (www.iapmo.org)

ICBO	International Conference of Building Officials (www.icbo.org)
ICAC	Institute of Clean Air Companies (www.icac.com)
ICEA	Insulated Cable Engineers Association (www.icea.net)
IEC	International Electrotechnical Commission (www.iec.ch)
IEEE	Institute of Electrical and Electronics Engineers (www.ieee.org)
IESNA	Illuminating Engineering Society of North America (www.iesna.org)
IFI	Industrial Fasteners Institute (www.industrial-fasteners.org)
IMSA	International Municipal Signal Association (www.imsasafety.org)
IPC	Institute for Interconnecting and Packaging Electronic Circuits (www.ipc.org)
ISA	Instrument Society of America (www.isa.org)
ISO	International Organization for Standardization (www.iso.ch)
ISS	Iron and Steel Society (www.issource.org)
ISSA	International Slurry Surfacing Association (www.slurry.org)
MBMA	Metal Building Manufacturers Association (www.mbma.com)
MHI	Material Handling Industry (www.mhia.org)
MS	Military Standards (MIL-SPEC) (www.dodssp.daps.mil)
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry (www.mss-hq.com)
MSHA	Mine Safety and Health Administration (www.msha.gov)
MUTCD	Manual of Uniform Traffic Control Devices (www.mutcd.fhwa.dot.gov)
NAAMM	National Association of Architectural Metal Manufacturers (www.naamm.org)
NAIMA	North American Insulation Manufacturers Association (www.naima.org)
NACE	National Association of Corrosion Engineers (www.nace.org)
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors (www.nationalboard.org)
NBS	National Bureau of Standards (now National Institute of Standards and Technology)
NCMA	National Concrete Masonry Association (www.ncma.org)
NDA	National Drilling Association (http://www.nda4u.com)
NEBB	National Environmental Balancing Bureau (www.nebb.org)
NEC	National Electric Code (www.nfpa.org/codes/)
NEMA	National Electrical Manufacturer's Association (www.nema.org)
NESC	National Electric Safety Code (http://standards.ieee.org/faqs/NESCFAQ.html)
NESHAP	National Emission Standards for Hazardous Air Pollutants (http://www.epa.gov/region4/air/asbestos/asbqa.htm)
NFLPA	National Fluid Power Association (www.nfpa.com)
NHLA	National Hardwood Lumber Association (www.natlhardwood.org)
NIOSH	National Institute of Occupational Safety and Health (www.cdc.gov/niosh/homepage.html)
NICET	National Institute of Certification in Engineering Technologies (www.nicet.org)
NIST	National Institute of Standards and Technology (www.nist.gov)
NFPA	National Fluid Power Association (www.nfpa.com)
NFPA	National Forest Products Association (www.forestprod.org)
NFPA	National Fire Protection Association (www.nfpa.org)
NPCA	National Paint and Coatings Association (www.paint.org)
NRCA	National Roofing Contractors Association (www.nrca.net)
NRMCA	National Ready-Mixed Concrete Association (www.nrmca.org)
NTIS	National Technical Information Services (www.ntis.gov)
NWWDA	National Wood Window and Door Association (www.nwwda.org)
OSHA	Occupational Safety and Health Act (www.osha.gov)
PCI	Precast/Prestressed Concrete Institute (www.pci.org)
PDI	Plumbing and Drainage Institute (www.pdionline.org)
PFI	Pipe Fabrication Institute (www.pfi-institute.org)
PPFA	Plastic Pipe and Fittings Association (www.ppfahome.org)
PPI	Plastics Pipe Institute (www.plasticpipe.org)
PPIC	Plumbing and Piping Industry Council
PSCAA	Puget Sound Clean Air Agency (www.pscleanair.org)
RMA	Rubber Manufacturers Association (www.rma.org)
SAE	Society of Automotive Engineers (www.sae.org)
SAMA	Scientific Apparatus Makers Association Group of Associations

SDI	Steel Deck Institute (www.sdi.org)
SDOI	Steel Door Institute (www.steeldoor.org)
SJI	Steel Joist Institute (www.steeljoist.org)
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association (www.samcna.org)
SPRI	Single Ply Roofing Institute (www.spri.org)
SSPC	Society for Protective Coatings (www.sspc.org)
STI	Steel Tank Institute (www.steeltank.com)
SWI	Steel Window Institute (www.steelwindows.com)
TCA	Tile Council of America (www.tileusa.com)
TEMA	Tubular Exchanger Manufacturer's Association (www.tema.org)
TPI	Truss Plate Institute (www.tpinst.org)
UBC	Uniform Building Code (Published by ICBO)
UBPPA	Uni-bell PVC Pipe Association (www.uni-bell.org)
UL	Underwriters Laboratories (www.ul.com)
UMC	Uniform Mechanical Code (Published by ICBO)
UPC	Uniform Plumbing Code (Published by IAPMO)
USBR	Bureau of Reclamation, U.S. Department of Interior (www.usbr.gov)
WAC	Washington Administrative Code (www.mrsc.org/wac.htm)
WCLIB	West Coast lumber Inspection Bureau (www.wclib.org)
WDOE	Washington State Department of Ecology - Criteria for Sewage Works Design
WEF	Water Environment Federation
WISHA	Washington Industrial Safety and Health Act (www.lni.wa.gov/wisha/)
WQA	Water Quality Association
WSDOT-APWA	Washington State Dept. of Transportation and American Public Works Association, Standard Specifications for Road, Bridge, and Municipal Construction
WWPA	Western Wood Products Association (www.wwpa.org)
WWPI	Western Wood Preservers Institute (www.wwpinstitute.org)
WAQTC	Western Alliance for Quality Transportation Construction (www.waqtc.org)

1.04 ACRONYMS

A. In addition to the above listings, wherever used in the Contract Documents, the following acronyms will have the meaning listed:
   1. APP Accident Prevention Program
   2. BMP Best Management Practice.
   3. CFR Code of Federal regulations
   4. HASP Contractor’s Site Specific Health and Safety Plan
   5. NTP Notice to Proceed.
   6. WTD Wastewater Treatment Division.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01195

PROTECTION AND MAINTENANCE OF PROPERTY AND WORK

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies protection and maintenance of underground and aboveground utilities, structures, fences, parking strips, sidewalks, driveways, streets, and other improvements which may be affected by the work.

B. This Section also specifies requirements for Contractor disposition of third party claims in a timely manner.

C. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 01560: Environmental Controls.
   2. Section 02160: Excavation Support Systems.

1.02 QUALITY ASSURANCE

A. Referenced Standards: This Section incorporates by reference the latest revision of the following document. It is a part of this Section as specified and modified. In case of conflict between the requirements of this Section and that of the listed document, the requirements of this Section shall prevail.

Reference	Title
Chapter 19.122 RCW	Underground Utilities.
WAC 296-155 Part N	Excavation, Trenching and Shoring.
WAC 296-24-960	Working on or Near Exposed Energy Parts.

1.03 SUBMITTALS

A. Procedures: Section 01300.

B. Listing and schedule of all potholing.

C. Listing of all utilities/facilities to be physically protected and relocated.

D. Shoring for all affected structures and utilities in accordance with Paragraph 01195-1.02.

1.04 LOCATION OF EXISTING UNDERGROUND FACILITIES

A. The Drawings do not indicate the existence and exact location of all underground facilities known to exist within the proposed area of work.

B. Abide by all the applicable requirements of Chapter 19.122 RCW.

C. Call Utility Underground Notification Center, 1-800-424-5555, for location of underground facilities. Call a minimum of 48 hours (2 business days) in advance of the Contractor's operations. Those utility owners who do not locate their facilities in accordance with Chapter 19.122 RCW are liable for costs incurred by the Contractor. If the Contractor discovers underground facilities which are not identified, the Contractor shall immediately notify the Project Representative of such facilities, and the Underground Notification Center.

D. Coordinate efforts to locate existing underground utilities. Prior to construction, review with the Project Representative the locations of existing utilities in relation to the new construction and evaluate areas of conflict.

E. The following is a list of utilities that may serve the work area. The listing is provided for the Contractor's convenience. The utility/facility owner or operator and the name and telephone number of a contact person are indicated for each utility listed. The list shall not be considered to be comprehensive or complete. There may be other utilities in the area that are not listed and some of the names and telephone numbers in the listing may have changed since the information was compiled. The County assumes no responsibility for the accuracy or completeness of the information in the list.

Utility/Facility	Owner or Agency	Contact Person	Telephone Number
Water			
Water			
Water			
Water			
Traffic			
Sewer			
Storm Drainage			
Communications			
Cable			
Gas Pipeline			
Fiber optics			
Fiber optics			
Fiber optics			
Power			

NTS: LIST ALL UTILITY AGENCIES. REVIEW THE REQUIREMENTS OF THE WORK TO ENSURE IT IS COMPLETE. CONTACT EACH AGENCY TO VERIFY CONTACT INFORMATION AND ENSURE ACCURATE DATA IS LISTED.

1.05 EXISTING UTILITIES AND FACILITIES

A. Unless otherwise specified or approved by the Project Representative, protect, modify, and/or relocate all existing utilities as required to complete the work.

B. In general, the locations of existing major utilities, whether aboveground or underground, are indicated on the Drawings with the exception of overhead power or other aboveground utilities supported on power/telephone poles. This information has been obtained from utility maps and field surveys. The County does not guarantee the accuracy or completeness of this information, and it is to be understood that other aboveground or underground facilities not shown on the Drawings may be encountered during the course of the work.

C. Contact all utility owners or operators having underground facilities within the work area and request the marking of their utilities. Contractor shall be responsible for damages resulting from any failure to contact utility owners for location, routing, and marking of a specific utility and its subsequent effects. Promptly notify the Project Representative prior to any work in the area of a utility where a utility owner fails to meet its obligations under Chapter 19.122 RCW.

D. The Drawings may show underground utilities which are to be relocated. Unless otherwise specified, be responsible for all these relocations prior to commencing work in the area. Coordinate efforts in locating existing underground utilities with the field staking. Review with the Project Representative the locations of existing utilities in relation to the new construction and evaluate areas of conflict.

E. Protect, modify, or relocate existing utilities and facilities required to accommodate Contractor's means and methods. The Contractor shall determine the requirements of the work of the Contract Documents and make provision for protection, modification, and relocation required to perform the work. Coordinate all protection, modification, and relocation work through the affected utility. Work to be completed to the utility owners requirements and standards.

F. Major underground utilities:
   1. For the purpose of this Section a major underground utility will be defined as a transmission, collection, or distribution line where it would be customary to expect that drawings would exist for the line and the utility owner would be aware of the line.
   2. An existing major underground utility is considered to be in conflict if it crosses or projects into the specified excavation at an elevation between the top and bottom of the proposed facility or when parallel to the new facility, and projects into the specified excavation. If the new facility does not meet the above listed requirements, then no conflict exists.
   3. The Contractor shall be responsible for all protection, affects, and damages on utility not in conflict with the new facility.
   4. When not shown on the Drawings and in conflict with the new facility, meet and agree with the Project Representative on how to proceed. Reimbursement for additional work will be per Section 00700.
   5. When not shown on the Drawings and no conflict with the new facility exists, no additional payment will be considered.
   6. When in a substantially different location and not in conflict with the new facility, no additional payment will be considered.
   7. When in a substantially different location and in conflict with the new facility, reimbursement for additional work will be per Section 00700.

G. Minor underground utilities:
   1. For the purpose of this Section a minor underground utility will be defined as services from a collection, or distribution line.
   2. The Contractor shall be responsible for all protection, affects, and damages on minor utilities not in conflict with the work.

H. Pipelines shown on the Drawings to be abandoned shall be plugged per the local agency requirements when encountered.

I. Storm and sanitary sewers:
   1. Existing live sewers shall remain in service. Adequate provisions shall be made for bypass of existing sewage flow, if required by the Project Representative. Immediately repair construction damage to the existing sewer system and manholes to a condition equal to or better than that existing prior to the damage. Repair all damage which results from the disturbance of the existing sewer.
   2. Remove water accumulating during construction from the new sewers and prevent it from entering existing lines. Flush existing pipes which were affected by the construction to the point of the next upstream connection and repair any pipelines or manholes damaged by gravel, rocks, or other debris that has entered the existing system during construction. The physical connection to an existing manhole or sewer line shall not be made until so authorized by the Project Representative.

J. Aboveground electrical, cable, and communication facilities:
   1. Attention is called to all overhead items including, but not limited to, power and telephone lines, temporary traffic signals, traffic signal mast arms, overhead sign bridges, sign support span wires, signs, and street lights.
   2. Observe the location of these overhead facilities and plan and conduct work operations accordingly.
   3. Take precautions to protect and avoid damage to all overhead facilities.
   4. Relocate facilities as required to meet the means and methods to be utilized.
   5. Observe and investigate the presence of facilities that may be affected by the work. Consult with utility owners and operators to determine the extent of any hazards and measures required. Determine the extent of any hazard created by facilities in all areas and follow approved safety procedures during the work.
   6. Support poles at risk of being undermined by the work.
   7. Follow the requirements of WAC 296-24-960 for energized primary conductors.

K. Gas:
   1. As required by the appropriate utility owner, protect, maintain, support in place, or relocate all gas mains crossing the pipeline trenches.

2. Provide a minimum of 12 inches of clearance, measured from edge to edge, between gas mains or gas service lines and new facilities. If relocating either utility is not practical, a protective wrap shall be provided for the entire distance where less than 12 inches of vertical clearance and less than 6 inches of horizontal clearance is provided. Wrapping material shall consist of either a split polyvinyl chloride (PVC) pipe or PVC wrapping of at least 0.04 inches in thickness, and shall be applied to either one of the pipes.
3. All abandoned gas mains encountered in the trench area shall be removed.
4. All temporary gas service slack lines shall be protected and maintained during pipeline installation.
5. Notify ***Puget Sound Energy*** at least two full working days (minimum of 48 hours) in advance of excavation in the vicinity of gas mains.

L. Water:
1. As required by the appropriate utility, protect, maintain, support in place, or relocate all water pipelines affected by the work.
2. Maintain water service at all times, as approved by the Project Representative.
3. Thrust blocks are not shown on the Drawings and shall be assumed to be present at all water line deflections of 12.5 degrees or greater, valves, or fittings.
4. Notify the Project Representative immediately of any damage. Begin repairs immediately, and work continuously until water service is restored. Coordinate repairs with utility owner.

M. Roadways:
1. Protect existing sidewalks, curbs, pavements, utilities, adjoining property, and structures, and to avoid damage thereto.
2. Traffic signage, paint striping, and channelization shall be protected and replaced if damaged by Contractor's operations.
3. Maintain the existing illumination pattern for signs and roads at all times unless otherwise specified.
4. Provide temporary roadway lighting as necessary.
5. Access for emergency equipment shall be maintained at all times.

N. U.S. Postal Service:
1. It shall be the Contractor's responsibility to follow any requirements of the U.S. Post Office for maintenance of postal service.
2. Where it becomes necessary to remove or otherwise disturb existing mail or newspaper boxes within the limits of Contract, Contractor shall install the boxes temporarily in such a position that their usefulness will not be impaired. After construction work has been completed, the boxes shall be reinstalled at the original locations or at locations order by the Project Representative.
3. Any damage caused by Contractor either to boxes or supports, due to Contractor's negligence, shall be repaired by Contractor at Contractor's expense to a condition equal to or better than that prior to the start of construction.

O. Garbage Collection Service:
1. Maintain access for garbage collection service.

1.06 SHORING AND BRACING OF EXISTING STRUCTURES

A. Shore up, brace, under-pin, and protect as necessary, the foundations and other parts of existing structures adjoining the site of the work that may be affected by the work. Be responsible for any damages because of settlements or the loss of lateral or subjacent support of adjoining property and from all loss and damages to adjoining and adjacent structures and their premises.

B. Fully comply with the requirements of WAC 296-155 Part N as applicable and Section 02160.

1.07 EMERGENCIES

A. Whenever work endangers the safety of life or property, including adjoining property or property in the immediate proximity of the work, take all reasonable and prudent actions to prevent loss or injury.

1.08 PROTECTION OF TREES AND VEGETATION

A. Per Section 01560.

1.09 DISPOSITION OF THIRD PARTY CLAIMS

A. The Contractor is responsible for all damage and consequential damages related to prosecution of the work. The County may receive notification of damage and consequential damages in writing as third party claims as a result of the prosecution of the work. When these third party claims are received by the County, they will be tendered to the Contractor. The Contractor is required to contact the claimant within 7 days of receipt of the claim from the Project Representative. The Contractor shall report to the Project Representative within 14 days of receipt with the Contractor's proposed action on the claim. If the Contractor fails to contact the claimant within the time stipulated above or finalize disposition of the claim within 30 days of receipt, the County may disposition the claim with the third party claimant and may withhold the amount of the settlement from the disposition from the next Application for Payment.

B. During all the procedural requirements listed above, the Contractor shall keep the Project Representative informed of the Contractor's plan and actual progress.

PART 2 PRODUCT

Not used.

PART 3 EXECUTION

3.01 GENERAL

A. Contact Utility Underground Notification Service prior to an excavation per the requirements in Part 1, General.

B. Pothole utility locations to be affected by the work prior to starting work in the area of the utility. Adjust work when location of utility is within 2 feet horizontal or vertical of the location shown on the Drawings. If the location of the utility is greater than two feet and the Contractor incurs additional cost, then the County will consider additional costs.

END OF SECTION

SECTION 01200

CONTRACT MEETINGS

NTS: THIS SECTION IS REQUIRED ON ALL CONTRACTS.

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies Contract meetings prior to, and during construction.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 01014: Work Sequence.
   2. Section 01310: Progress Schedules and Reports.

1.02 PRECONSTRUCTION CONFERENCE

A. The Project Representative will chair a meeting of representatives of the Contractor, subcontractors, County staff, and other affected agencies prior to beginning construction. The purpose of the meeting will be to establish lines of authority and communication within the Contract team, to discuss the administrative requirements of the Contract, to distribute forms to the Contractor to be utilized on the Contract, to discuss design, design intent, community and permitting issues, and to define the duties and responsibilities of all parties. Discussion may cover specific Drawings, Specifications, facility entry/exit and sign-in/sign-out procedures, unusual job site conditions, schedules of completion, health and safety, watching of a safety video, mobilization, equal employment regulations, civil rights requirements, apprenticeship programs, and other pertinent features of the Contract. Notification of the preconstruction conference will be made at least seven days prior to the conference.

B. Ensure that the Contractor's representative, superintendent, Safety Officer, and representatives of all major subcontractors are present at the meeting.

C. Provide Draft Construction Schedule per Section 01310, for review and discussion.

D. Provide HASP meeting the requirements of Section 01063, at the Preconstruction Conference.

1.03 PROGRESS MEETINGS

A. Attend weekly progress meetings to discuss the agenda items listed below including plans for the following two weeks and to evaluate progress to date and since the last meeting. Unless on-site facilities are provided by the Contractor, all progress meetings will occur at a mutually agreed upon off-site location.

B. Arrange for attendance of subcontractors as necessary to discuss job progress.

C. When required by the Project Representative, attend meetings of other contractors working in the area to coordinate the work of this Contract with other work in the vicinity.

D. Meeting time to be mutually agreed to between the Project Representative and Contractor Representative.

NTS: WEEKLY MEETINGS ARE NOT REQUIRED FOR SMALLER TYPE CONTRACTS. THIS PARAGRAPH CAN BE ADAPTED TO REFLECT LESS THAN WEEKLY MEETINGS. AGREE WITH CM REPRESENTATIVE ON THE TIMING OF THE MEETINGS

1.04 ATTENDANCE AT PROGRESS MEETINGS

A. Progress meeting attendance:
   1. Project Representative and other County staff.
   2. ***City of Redmond staff.***
   3. Contractor's representative and other Contractor staff.
   4. Other contractors, as pertinent to agenda.
   5. Subcontractors, as pertinent to agenda.
   6. Contractor Safety Officer.
   7. Representatives of governmental agencies, other regulatory agencies, or utilities.

1.05 AGENDA FOR PROGRESS MEETINGS

A. In general:
   1. Review and approve minutes of previous meeting.
   2. Review work progress since last meeting.
   3. Note field observations, problems and decisions.
   4. Identify problems that impede planned progress.
   5. Contractor needs list to allow the construction schedule to be met.
   6. Review off-site fabrication status and problems.
   7. Develop corrective measures and procedures to regain planned schedule.
   8. Update construction schedule as indicated.
   9. Review planned work during next scheduled look-ahead period per Section 01310.
   10. Coordinate projected work with other contractors.
   11. Review submittal schedules and status of outstanding submittals.
   12. Discuss maintaining quality and work standards.
   13. Review changes for:
      a. Effect on construction schedule.
      b. Effect on all dates required by Section 01014.
   14. Review status and action required for changes.
   15. Request Contractor to discuss all issues which the Contractor considers additional scope, cost, or impact to the Contract.
   16. Review safety measures. Identify and discuss areas of concern.
   17. Review of M/WBE, Apprenticeship and EEO Compliance, as applicable.
   18. Other items as required.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01300

SUBMITTALS PROCEDURE

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies procedures and requirements for all submittals, substitutions, deviations, and the master submittal list required by the Specifications.

B. Submit descriptive information which will enable the Project Representative to assess whether the proposed materials, equipment, or methods of work are in general conformance with the work and in compliance with the Contract.

C. No fabrication or construction work shall occur on a specific submittal item without a submittal disposition stated in Paragraph 01300-3.03B.1 or -B.2.

1.02 MASTER SUBMITTAL LIST

A. Prepare and submit within 20 days after the effective date of the Notice to Proceed, a Master Submittal List listing all items for which submittals are required by the Specifications. Provide a schedule indicating the submittal dates for each submittal. Organize by Specification Section number and include the following information for all listed items:
   1. Item identification.
   2. Specification Section number.
   3. Identification of those items which are substitutions or contain deviations from the Specifications.
   4. Identification of those items which require other jurisdictional agency review and approval.
   5. Columns for future use as information becomes available shall be provided for the following items:
      a. Trade name, model, and catalog designation.
      b. The scheduled need dates for control purposes.
      c. Date submitted.
      d. The date approval is needed.
      e. The date on which material is needed.

B. Coordinate and integrate all submittal dates with the Baseline Schedule.

1.03 CONTRACTOR RESPONSIBILITIES

A. Be responsible for the accuracy and completeness of the information contained in each submittal.

B. Verify that the material and equipment described in each submittal conforms to the requirements of the Contract prior to submittal.

C. Ensure that the material, equipment and methods of work used shall be as described in the submittal.

D. Ensure there is no conflict with other submittals. Notify the Project Representative where such submittal may affect the work of another submittal.

E. Ensure coordination of submittals among the suppliers, related crafts, subcontractors, and with the planned work.

F. Submit a request using Form 01300-B received from the Project Representative for all substitution requests.

G. Call out all deviations from the Contract on the submittal Form 01300-A received from the Project

Representative and note where applicable in the body of the submittal.

1.04 APPROVED EQUAL

A. Definition: an item of material or equipment proposed by the Contractor that has the same function, quality, durability, appearance, strength, and design characteristics equal to that named, that meets the requirements of the Specification, and is sufficiently similar so that no change in related work is required. The item of material or equipment shall reliably perform at least equally well for the function imposed by the design concept of the completed work as a functioning whole. In general, approved equal applies to manufactured items.

B. Clearly mark on the submittal Form 1300-A.

C. Acceptance is at the Project Representative's sole discretion and the decision regarding acceptance or rejection shall be final. Contractor shall not assume acceptance at any time prior to the rendering of decision by the Project Representative. The decision cannot be appealed within the provisions of Section 00700.

1.05 SUBSTITUTION

A. Definition: an item of material, equipment, means, method, technique, sequence, or procedure which functionally meets the Contract requirements, but does not exactly meet the Specification and is equal to or better than the specified item.

B. Submit a request for substitution with the submittal. Use Form 01300 – B and address and complete all items in the form. The request shall include complete specifications or means and methods for the item including all descriptive and cost data.

C. Substitutions shall be authorized only by Change Order to the Contract.

D. Acceptance is at the Project Representative's sole discretion and the decision regarding acceptance or rejection shall be final. Contractor shall not assume acceptance at any time prior to the rendering of decision by the Project Representative. The decision cannot be appealed within the provisions of Section 00700.

1.06 DEVIATIONS

A. Definition: related to changes to a specified procedure, material, or product proposed by the Contractor that does not fully conform to the requirements specified, but can be shown to accomplish the intent and functional requirements of the end product.

B. Annotate in the submittal all deviations from stated requirements in the Contract. Failure to identify any deviation and subsequent acceptance of the submittal by the County shall not relieve the Contractor from complying with the Contract.

C. Acceptance is at the Project Representative's sole discretion and the decision regarding acceptance or rejection shall be final. Contractor shall not assume acceptance at any time prior to the rendering of decision by the Project Representative. The decision cannot be appealed within the provisions of Section 00700. A change order may be required by the Project Representative for an accepted deviation.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 TRANSMITTAL PROCEDURE

A. General:
   1. Submittals shall be accompanied by Submittal/Transmittal Form 01300-A received from the Project Representative. Equipment numbers shall be listed on Form 01300-A for items being submitted. A separate form shall be used for each specific item, class of material, equipment, and items specified in separate, discrete sections for which a submittal is required. Submittals for various items shall be made with a single form when the items taken together constitute a manufacturer's package or are so functionally related that expediency indicates checking or review the group or package as a whole. No multiple-Section submittals will be allowed except where previously approved by the Project Representative.
   2. A unique number, sequentially assigned, shall be noted on the transmittal form accompanying each item submitted. Original submittal numbers shall have the following format: "XXX"; where "XXX" is the sequential number assigned by the Contractor. Resubmittals shall have the following format: "XXX-Y"; where "XXX" is the originally assigned submittal number and "Y" is a sequential letter assigned for resubmittals, i.e., A, B, or C being the 1st, 2nd, and 3rd resubmittals, respectively. Submittal 25B, for example, is the second resubmittal of Submittal 25.
   3. Submit all proposed approved equals as a part of the submittal process.

3.02 SUBMITTAL COMPLETENESS

A. Submittals without all required information are not acceptable and may be returned. The Project Representative may choose to put an incomplete submittal on hold for up to seven days to allow time for the Contractor to provide missing information. The on-hold time will be in addition to the days specified for the return of a submittal stated in Paragraph 01300-3.03B.

3.03 REVIEW PROCEDURE

A. Unless otherwise specified, for each submittal, submit the following:
   1. One reproducible original of all submitted information. Individual sheets shall not exceed 22 inches x 34 inches.
   2. Seven additional copies of each submittal including all submitted information.
   3. Samples: Submit the number requested in the Specification Section.
   4. Certificates: Will be considered as information. No copy shall be returned.

NTS: 30 DAYS LISTED IN THE NEXT PARAGRAPH IS THE MAXIMUM TIME AND THE STANDARD AMOUNT OF TIME. IF 30 DAYS IS SHORTENED, AGREEMENT WITH THE REVIEWING ENGINEER'S AND THE CM SHALL BE OBTAINED.

B. Unless otherwise specified in the Technical Specifications, within 30 days after receipt of each submittal or resubmittal, the submittal or resubmittal will be returned to the Contractor. The returned material will consist of a maximum of three marked-up copies of the submittal. The returned submittal will indicate one of the following actions:
   1. If the review indicates that the submittal is in general conformance with the Contract, the submittal copies shall be marked "No Exceptions Taken" and given a Review Action of "1." In this case, implement the work covered in the submittal.
   2. If the review indicates that the submittal requires limited corrections, the submittal copies will be marked "Note Markings" and given a Review Action of "2." In this case, begin to implement the work covered in the submittal in accordance with the markings noted. Where submittal information is to be incorporated in O&M data, a corrected copy shall be resubmitted; otherwise, no further action is required.
   3. If the review reveals the submittal is insufficient and contains incorrect data and the comments are of a nature that can be confirmed, the submittal copies shall be marked "Comments Attached --Confirm" and given a Review Action of "3." . A Review Action "3" does not allow implementation of the work covered by the submittal until the information requested to be confirmed in the submittal has been revised, submitted, and returned to the Contractor with a Review Action of either "1" or "2."
   4. If the review reveals the submittal is insufficient or contains incorrect data and the comments require that the submittal be revised and resubmitted, the submittal copies shall be marked "Comments Attached --Resubmit" and given a Review Action of "4." . A Review Action "4" does not allow implementation of the work covered by the submittal until the information in the

submittal has been revised, resubmitted, and returned to the Contractor with a Review Action of either "1" or "2."."

5. If the review reveals that the submittal is not in general conformance with the Contract, or if the submittal is incomplete, the submittal copies shall be marked "Rejected" and given a Review Action of "5." Submittals containing deviations or substitutions from Contract which have not been clearly identified by the Contractor fall into this category. A Review Action "5" does not allow implementation of the work covered by the submittal until the information in the submittal has been revised, resubmitted, and returned with a Review Action of either "1" or "2."

3.04 EFFECT OF REVIEW OF SUBMITTALS

A. Review of submittals shall not relieve the Contractor of its responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the County.

B. Unless identified by the Contractor specifically on the submittal, no disposition of the submittal by the Project Representative changes the requirements of the Specification and Drawings.

END OF SECTION

SECTION 01310

PROGRESS SCHEDULES AND REPORTS

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies requirements and procedures for preparing construction schedules, schedule of values, reports, and fixed asset information

B. The purpose of the construction schedules, schedule of values and reports are to ensure adequate planning and execution of the work by the Contractor, to establish the standard against which satisfactory completion of the work shall be judged, to assist in monitoring progress, to determine progress payments and to assess the impact of Change Orders on the construction schedule.

C. Requirements of this Section replace the requirements listed in Section 00700, Articles 4.2 and 4.3.

D. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 01200: Contract Meetings.
   2. Section 01999: Standard Forms.

1.02 SUBMITTALS

A. Procedures: Section 01300.

B. Schedules:
   1. Draft construction schedule: Submit for review at the Preconstruction Conference.
   2. Construction schedule: Submit within 15 days of the Draft Construction Schedule submitted at the Preconstruction Conference identified in Section 01200.

C. Weekly progress reports: During the work, submit no later than during the weekly Contract meetings.

D. Monthly report: Submit with Application for Payment.

1.03 CONSTRUCTION SCHEDULES

A. Draft construction schedule: Include material and equipment procurement and construction work. Clearly indicate major milestones and the time(s) for completion which are required to be met under the terms of the Contract. Include the bar chart and a draft schedule of values for lump sum bid items.

B. Construction schedule: Include the bar chart, schedule of values for lump sum bid items, and cash flow projection. The schedule submitted shall be considered the Baseline Schedule.

C. Time scaled bar chart based on the construction schedule prepared on 11-inch x 17-inch sheets. Band by activities as approved by the Project Representative.

D. Activities: Show on construction bar charts at their early start/finish period.

E. Submittal and procurement activities shall include preparation and submittal of shop drawings, product data, samples, fabrication, delivery, and as-built drawings.

F. Include in the construction schedule milestone dates as specified in other Sections of the Contract.

G. Dates indicated on the schedule by the Contractor shall not be binding on the Project Representative.

H. Failure of the Contractor to include a element of work required for the performance of this Contract shall not excuse the Contractor from completing the work as described in the Contract.

I. Provide a list of the holidays and non-work days applicable to the schedule.

J. Work Breakdown Structure
   1. At a minimum, break the schedule down and band the categories listed in the bid schedule and into the following categories:
      a. Submittal and review per Section 01300.
      b. Preparation, submittal, fabrication, and delivery of major materials as shown in the specifications.
      c. Pipeline replacement and rehabilitation work shall be segregated on a block by block basis within street right-of-way, and on a manhole-to-manhole basis for work within easements.
      d. Where work is being performed on private property, provide breakdown for:
         1) CCTV Inspection.
         2) Preparation, submittal, fabrication and delivery of pipeline rehabilitation materials.
         3) Rehabilitation work.
         4) Private property restoration.
      e. Testing.
      f. Restoration within right-of-way.
      g. Record drawing preparation.

1.04 SCHEDULE OF VALUES

A. Submit a balanced schedule of values for each lump sum bid item.

B. The value to be allocated to the mobilization/demobilization lump sum bid item shall not exceed 5 percent of the original Contract Price.

C. If, in the opinion of the Project Representative, the schedule of values for any lump sum bid item is unbalanced, present documentation substantiating the cost allocations of those activities believed to be unbalanced.

1.05 WEEKLY PROGRESS REPORT

A. Include a 2-week look-ahead schedule showing what work the Contractor anticipates working on. Where work is being performed on private property, provide a list of addresses where the Contractor anticipates working. This schedule should provide greater detail than the construction schedule.

1.06 MONTHLY REPORT

A. Include an updated construction bar chart, schedule of values, cash flow projection and narrative summary.

B. The narrative summary briefly describes the progress of the project. The report will describe how the project is progressing towards its completion. It shall identify milestones completed, major equipment deliveries and problems arising during the month. The report should project the work anticipated during the coming month, including major deliveries and submittals.

1.07 CASH FLOW REPORT

A. Include a forecast, by month, based on the current schedule, of cash requirements to complete the Contract.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 GENERAL

A. Provide a statused construction schedule and narrative summary so the Project Representative may use them as a basis for determining the Contractor's compliance with the Contract regarding progress payments, Contract Time extensions, change order prices and impacts, and the overall progress of the work. Failure to comply with the requirements of this Section will be a cause for delay in the review and acceptance of the progress payment requests.

3.02 UPDATES

A. If actual progress is observed to deviate from the construction schedule by 1 week behind or 1 week ahead, update and submit a revised construction schedule. In the case of the work being behind schedule, submit, along with the revised construction schedule, a written plan for completing the work within the milestone and Contract Time.

B. Requests for extensions in time resulting from changes issued by the County shall be accompanied by a narrative report explaining the impacts and costs associated with the extension. This request shall be submitted in accordance with Section 00700.

C. On approval of a change order by the County, the approved change shall be reflected in both time and value in the next submission of progress reports and schedule updates. Contract Time extensions and schedule revisions shall be incorporated into the monthly updated construction schedule and schedule of values.

3.03 CONDITIONS FOR PAYMENT

A. The following criteria shall be met prior to release of payment of these specific items:
   1. Mobilization:
      a. When five percent of the total original Contract amount is earned from other Contract items, excluding amounts paid for materials on hand, 50 percent of the amount allowed by Section 01025 for mobilization will be paid.
      b. When ten percent of the total original Contract amount is earned from other Contract items, excluding amounts paid for materials on hand, the remaining 50 percent of the amount allowed by Section 01025 for mobilization will be paid.
   2. Demobilization:
      a. When Substantial Completion is achieved, 75 percent of the amount allowed by Section 01025 for demobilization will be paid.
      b. When all punch list items are completed, the remaining 25 percent of the amount allowed by Section 01025 for demobilization will be paid.
   3. Materials on hand: material or equipment amount as allowed in Section 00700.
   4. Record drawings: see Section 01720.

END OF SECTION

NTS: DETERMINE HOW THE WORK IS TO BE RECORDED. NEED TO DETERMINE IF THERE IS BENEFIT TO THE COUNTY FOR ESTABLISHING A CONTRACTOR REQUIREMENT FOR PHOTOGRAPHS. CIPP REHABILITATION WORK GENERALLY DOES NOT REQUIRE PHOTOGRAPHS. DISCUSS THE BENEFITS FOR PHOTOGRAPHY WITH CM TEAM MEMBER AND INCLUDE ONLY WHAT PHOTOGRAPHY REQUIRED. CONSIDER THE USE OF DIGITAL PHOTOS AND VIDEOTAPING WORK DURING THE WORK.

SECTION 01380

PHOTOGRAPHS

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies photographs to be provided prior to, during, and after construction.

1.02 SUBMITTALS

A. Procedures: Section 01300.

B. Pre-construction, construction, and post construction photographs.

PART 2 PRODUCTS

2.01 PHOTOGRAPHS

A. Photographs shall be taken on film and printed. Emulsion-based photos shall be a minimum 35 mm film size and shall indicate on the front of each print the date, name of work, and location where the photograph was taken.

B. One 8-inch x 10-inch glossy print of each exposure, together with the negatives. Submit within ten days following each set of exposures.

C. Samples of prints of acceptable quality and identification are available in the Project Representative office for examination.

PART 3 EXECUTION

3.01 GENERAL

A. Photographs shall be taken at locations to be designated by the Project Representative.

B. The photographer shall be equipped to photograph either interior or exterior exposures, with lenses ranging from wide-angle to telephoto.

3.02 PRECONSTRUCTION PHOTOGRAPHS

A. Provide pre-construction photographs and video record prior to commencement of work on the site. Provide ____ exposures of the area where the work is to take place.

B. For pipeline projects, the work site will continue to move. Do not take pre-construction photos more than five days prior to commencing work in any area.

NTS: IF WORK IS BEING PERFORMED ON PRIVATE PROPERTY, PROVIDE SPECIFIC REQUIREMENTS ON WHERE AND HOW PHOTOS ARE TO BE TAKEN.

3.03 CONSTRUCTION PHOTOGRAPHS

A. Provide construction photographs during the progress of the work. Take monthly exposures starting 1 month after the date of the pre-construction photographs and continuing as long as the work is in progress.

B. For pipeline projects, the work site will continue to move. Ensure each photo is annotated by stations or in such a manner that a reviewer can clearly understand precisely where the photo was taken and what aspect or view of the work is presented.

NTS: IF WORK IS BEING PERFORMED ON PRIVATE PROPERTY, PROVIDE SPECIFIC REQUIREMENTS ON WHERE AND HOW PHOTOS ARE TO BE TAKEN.

3.04 POSTCONSTRUCTION PHOTOGRAPHS

A. Take the number of exposures specified until Final Acceptance of the work.

3.05 REQUIRED NUMBER OF PHOTOGRAPHS

NTS: SELECT THE NUMBER OF EXPOSURES OR PHOTOS, AND THE TYPES OF PHOTOS TO BE PROVIDED. SIGNIFICANTLY MORE PHOTOS WILL BE REQUIRED IF WORK IS BEING PERFORMED ON PRIVATE PROPERTY.

A. For the work of this Contract, photographic prints shall be provided as follows:

CATEGORY	AMOUNT OF PHOTOS
Pre-construction	
Construction (Monthly)	
Post construction	

END OF SECTION

SECTION 01410

INSPECTION AND TESTING

PART 1 GENERAL

1.01 SUMMARY

A. This Section is supplementary to the applicable testing and inspection program in Section 00700 and describes the responsibilities of all parties pertaining to testing and inspections.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. ***Section 02200: Earthwork.***
   2. ***Section 02221: Trenching, Backfilling and Compacting.***
   3. ***Section 02513: Asphalt Paving.***
   4. ***Section 02610: Sanitary Sewerage.***
   5. ***Section 02651: Manhole Rehabilitation.***
   6. ***Section 02652: Cure-in-Place Pipe.***
   7. ***Section 02653: Service Connection Rehabilitation Liner.***
   8. ***Section 02656: Service Connection and Lateral Rehabilitation Liner.***
   9. ***Section 02761: Television Inspection of Existing and Rehabilitated Sewers.***
   10. ***Section 02766: Installation of Sewer by Pipe Bursting.***
   11. ***Section 03310: Controlled Density Fill (CDF).***
   12. ***Section 03600: Grout for Manholes.***
   13. ***Section 09910: Coatings for Manholes.***

NTS: MODIFY SECTION NUMBERS ABOVE TO REFERENCE SECTIONS WHERE TESTING IS REQUIRED.

1.02 INSPECTIONS AND TESTING

A. The Project Representative may throughout the duration of construction, inspect construction and test materials to assure conformance with these Specifications. At a minimum, the Project Representative may conduct monitoring and testing for earthwork compaction, asphalt, CIPP, coating, and other independent monitoring as required.

B. The Contractor shall provide all labor, equipment and apparatus necessary for in place testing of rehabilitated mainlines, laterals, lateral interfaces and manholes, and collection of resin and liner samples as described in the Technical Specifications.

1.03 COSTS

A. Paid by the County:
   1. Testing, as defined in Paragraph 01410-1.02A, and inspection will be paid by the County, except as indicated below.

B. Paid by the Contractor:
   1. Retesting and reinspection required because of defective work.
   2. Testing performed for the convenience of the Contractor.
   3. Cost for work as defined in Paragraph 01410-1.02B and 1.05.

1.04 SUBMITTALS

A. Contractor shall submit two copies of all test reports to the Project Representative.

1.05 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with testing personnel. Provide access to the work and to supplier's operations.

B. Provide to the laboratory representative samples of materials to be tested in the required quantities.

C. Furnish labor, equipment, and facilities:
   1. For access to work to be tested.
   2. To obtain and handle test samples at the site.
   3. To facilitate inspections and tests including traffic control and safety equipment.
   4. For laboratory's exclusive use for storage and curing test samples until removed to the laboratory.
   5. To repair any test areas in order to match original conditions.
   6. For all testing and inspection in supplier's facilities.

D. Additional testing or inspection necessary for noncompliant work shall not be cause for claims for delay or extra work.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the following Contractor temporary construction facilities and construction requirements:
   1. Utilities: power, heating, ventilation, telephone, water, and sanitary facilities.
   2. Work site access control: concrete barriers, fencing, and security.
   3. Miscellaneous items: parking, staging, cleaning, project signage, and Contractor facilities.
   4. Roads: haul roads, haul routes, and access roads.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 01062: Permits and Easements.
   2. Section 01560: Environmental Controls.
   3. Section 01570: Traffic Regulation.

C. There are no designated parking and staging areas for this contract. The Contractor shall be responsible for obtaining and maintaining parking and staging areas.

1.02 SUBMITTALS

A. Procedures: Section 01300.

B. Access and Haul Plan:
   1. Transportation routes.
   2. Haul locations.
   3. Haul summary reports: weekly.

C. A plan to meet each of the requirements of this Section.

1.03 POWER

A. Provide power and coordinate requirements with the electrical utility for power takeoff points, voltage and phasing requirements, transformers and metering.

1.04 HEATING

A. Provide temporary heating as necessary to protect work and material against damage by dampness and cold, and to facilitate completion of the work. Supply the fuel, equipment, and materials required for temporary heating.

1.05 VENTILATION

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gasses.

1.06 TELEPHONE

A. Provide for Contractor's own use, telephone service at the construction site office.

B. In order that the Project Representative can coordinate with the Contractor on a local exchange, the Contractor shall provide a telephone number and contact, where long distance does not apply, for Project Representative calls to field personnel.

C. A mobile phone may be used as the construction site phone, however, it shall always be on site during construction hours for contact of field personnel by the Project Representative.

1.07 WATER

A. Provide and coordinate necessary water, piping, backflow prevention, metering, and special connections with water supplying utility. Obtain hydrant use permits and pay utility for water if required.

1.08 SANITARY FACILITIES

A. Provide toilet and wash-up facilities for the work force at the site. Comply with applicable laws, ordinances, and regulations pertaining to the public health and sanitation of dwellings and camps.

1.09 CONCRETE BARRIERS

A. Limit access to excavations, hazardous areas, and protect existing facilities from damage during construction and demolition operations. Use and maintain concrete barriers as required.

1.10 FENCING

A. Prevent unauthorized entry to construction areas and protect public safety at all times during the construction period. Use fencing, if required, to enclose the areas of the site during off-work hours.

1.11 CONTRACTOR'S SECURITY

A. Provide security and facilities to protect public safety and to protect the work, and all temporary and existing facilities from unauthorized entry, vandalism, or theft.

1.12 HAUL ROADS AND LOCATIONS

A. Provide as necessary for the work.

B. Submit all haul locations for all types and classification of material to be moved to or from the worksite. If haul locations are to be added or location of material haul location is changed, submit new haul location and types and classification of material.

C. Submit weekly in the haul summary report the type, amount, and location of disposal of material removed from the site.

D. Provide a legal, off-site debris disposal site for all material that leaves the work site.

E. Repair any damage to roadway surfaces from the direct or indirect result of the Contractor's operation to the requirements of the responsible agency.

1.13 RESTORATION OF ROADS

A. Clean roads used by the Contractor as required during and after completion of the work.

B. Unless otherwise specified, resurface paved roadways, and bring to original grade and section roads which are not paved, where the surface is removed, broken, damaged, caved, or settled by the Contractor’s operations during the work.

1.14 MAINTENANCE OF TRAFFIC

A. Conduct the work to interfere minimally with public travel, whether vehicular or pedestrian.

1.15 PARKING AND STAGING AREA

A. There are no designated parking and staging area at the proposed site. Contractor shall be responsible for obtaining and maintaining parking and staging areas.

B. Stockpiling and storage of materials and equipment in the road right-of-way shall not be permitted unless approved in advance by the ***Agency***.

C. Do not park or store materials on private property. Do not block driveways or park in parking lots for businesses.

1.16 CLEANING

A. Remove debris from closed or remote spaces, prior to enclosing the space.

1.17 CONTRACTOR'S FACILITY

A. Maintain a suitable facility near the site of the work to be the headquarters of the Contractor's representative authorized to receive drawings, instructions or other communication or articles.

B. Communications given to the Contractor's representative or delivered at the site facility in the Contractor's absence shall be deemed to have been delivered to the Contractor.

C. Copies of the Drawings, Specifications, permits, APP and HASP per Section 01063, regulatory required items, Construction Standards, and other Contract Documents shall be kept at the site facility and available for use at all times.

1.18 TRANSPORTATION ROUTE

A. Select transportation route for hauling materials and equipment without creating traffic congestion. Construction traffic flow scheme for the entire work is required in Section 01570.

1.19 ROAD CLOSURES

A. Temporary detours and road closures due to work of others are not anticipated to interfere with this Contract.

1.20 PRIVATE ACCESS (GENERAL)

A. Where required by the Contract, or by choice of the Contractor, access may be over private land, in which case the access shall be maintained by and at the expense of the Contractor. Comply with all requirements of Section 01062.

1.21 CONSTRUCTION SIGNS

A. Commercial or advertising signs shall not be allowed on the site.

B. The Contractor shall install three (3) signs furnished by the County, and shall relocate each sign once during the contract period, as directed by the Project Representative.

1. Provide support system for each sign at every installation location. Support system shall be two 4x4 wood posts with galvanized mounting hardware.

2. Set posts to a minimum depth of 3 feet below grade and backfill with compacted soil.

3. Install signs per the Federal Highway Administration Manual on Uniform Traffic Control Devices (MUTCD).

4. Remove the signs after Substantial Completion, as directed by the Project Representative and return to the County.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 RESPONSIBILITIES

A. Ensure all subcontractors, suppliers and individuals associated with Contract activities use approved routes.

B. Provide required signage and Contractor oversight for approved route to ensure compliance with traffic routing requirements. If Contractor fails to abide by the approved haul routes, the Project Representative will assign City off-duty police officers for enforcement of haul route restrictions at the expense of the Contractor.

C. Inspect haul routes daily to assure compliance with Section 01560.

3.02 IMPROVEMENT, MAINTENANCE AND RESTORATION OF HAUL ROUTES

A. Be responsible for any improvements, maintenance and restoration of haul routes related to construction use.

B. Share haul routes with traffic and maintain in good condition. Haul routes shall remain smooth, level and suitable for the public to drive passenger cars on without damage to vehicles.

C. Restore haul routes to their initial condition after they are no longer needed for construction purposes.

END OF SECTION

SECTION 01560

ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies environmental mitigation and temporary environmental controls required to be maintained during construction.

1.02 QUALITY ASSURANCE

A. Referenced Standards: This Section incorporates by reference the latest revisions of the following documents. They are part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

Reference	Title
King County Surface Water Management	Surface Water Design Manual
Washington Department of Ecology	Stormwater Management Manual for the Puget Sound Basin
Washington Department of Ecology	NPDES and State Waste Discharge Baseline General Permit for Stormwater Discharges Associated with Industrial Activities
RCW 90.48	Water Pollution Control
Agency	***Standard Specifications and Details***

1.03 SUBMITTALS

A. Procedures: Section 01300.

B. Environmental Mitigation Plan and all its revisions.

C. Indicate locations and methods to be used for temporary erosion and sedimentation control for excavation and stockpile areas.

1.04 ENVIRONMENTAL MITIGATION PLAN (PLAN)

A. Develop and maintain for the duration of the Contract a Plan which will effectively incorporate and implement all required environmental protection precautions. Use the form provided by the Project Representative at the Preconstruction Conference.

B. If required, the Stormwater Pollution Prevention Plan shall be incorporated in the Plan.

C. Appoint an employee who is qualified and authorized to supervise and enforce compliance with the Plan. Ensure that all necessary pollution control equipment, supplies, or materials are available to implement the Plan.

D. In the event that the County, regulatory agencies or jurisdictions determine the Plan to be inadequate to protect environment:
   1. Stop the work in progress until adequate environmental protection measures are implemented.
   2. Modify the Plan to meet the requirements of said regulatory agencies, jurisdictions, and the County.
   3. Submit the revisions to the Plan within 7 days of the notice of deficiency.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 SITE MAINTENANCE

A. Keep the work site, including staging areas and Contractors' facilities, clean, neat and free from rubbish and debris. Remove materials and equipment from the site when they are no longer necessary. Upon completion of the work and before request for inspection, clear the work site of equipment, unused materials, and rubbish to present a clean and neat appearance.

B. Do not allow waste material to remain on the site of the work or on adjacent streets. Collect, carry off the site and legally dispose of such materials daily.

C. Be responsible for obtaining necessary permits or approval for the Contractor’s disposal sites.

D. In the event that waste material, refuse, debris, and rubbish are not removed from the work site, the County reserves the right to have the waste material, refuse, debris and rubbish removed at the Contractor’s expense.

E. Handle paints, solvents, and other construction materials with care to prevent entry of contaminants into storm drains, sanitary sewers, surface waters, or soils.

F. Unless otherwise indicated, restore ground surface to its pre-construction condition. Restore disturbed areas by replanting or repaving as soon as practical after construction.

3.02 STREET CLEANING

A. Use sealed trucks for the removal of all contaminated or flowing running spoils from the construction site.

B. Prevent dirt and dust from escaping trucks departing the work site.

C. When working dump trucks and other equipment on paved streets and roadways, clean the streets no later than at the end of each day’s operations and at such interim periods as required to keep streets clean. Clean the area using a vacuum broom. Cleaning equipment shall be available 24 hours per day, while haul routes are in use.

D. Violations of the above requirements are sufficient grounds for the Project Representative to order the streets in question to be cleaned by others with all withheld from the Application for Payment.

E. Flush no solid material or soils into catch basins, ditches, or sewer manholes.

3.03 WATER AND EROSION CONTROL

A. Temporary drainage: conform to the regulations and requirements of legally authorized surface water management agencies.

B. Prevent solids or turbid runoff from entering storm drains, sanitary sewers, or local surface waters. Cover excavated areas, spoil piles, and imported or stored fill materials. Cut and cover techniques, sediment barriers around storm drains and construction sites, siltation fencing, and similar erosion control measures shall be employed as required to prevent contamination of local surface waters.

C. Erosion control measures shall be installed prior to excavation, clearing, or grading activities.

D. Erosion and sedimentation control measures shall be in place prior to any clearing or grading activity. Disturbed areas and spoils piles shall be covered, bermed, or otherwise secured when runoff from rain is or would be likely to cause turbid water that may enter local water bodies. Work shall be suspended if it cannot be performed without causing turbid runoff to leave the construction area or enter local water bodies.

3.04 TEMPORARY DAMS

A. Except in times of emergency, earth dams are not acceptable at catch basin openings, local depressions, or elsewhere. Temporary dams of sand bags, asphaltic concrete, or other acceptable material will be permitted when necessary to protect the work, however, their use should not create a hazard or nuisance to the public. Remove such dams from the site as soon as they are no longer necessary.

3.05 AIR POLLUTION CONTROL

A. Do not discharge smoke, dust, and other contaminants into the atmosphere that violate the regulations of legally constituted authorities. Do not allow internal combustion engines to idle for prolonged periods of time. Maintain construction vehicles and equipment in good repair. When exhaust emissions are determined to be excessive, repair or replace equipment.

B. Use electrically-powered equipment where practical.

C. Minimize dust nuisance by cleaning, sweeping, and sprinkling with water, or other means. The use of water, in amounts which result in mud on public streets, is not acceptable as a substitute for sweeping or other methods. Make equipment for this operation available at all times.

D. Provide ventilation fan and carbon filter for odor control for odor-problem manholes when directed by Project Representative.

3.06 NOISE CONTROL

A. Noisy operations shall be scheduled to minimize their duration. ***Comply with Agency Noise Ordinance #_____.***

B. Notify residents and businesses near active construction areas of upcoming noisy construction activities that will exceed 70 dBA at 50 feet from equipment and activities.

C. Unless otherwise indicated through a noise variance, comply with local controls and noise level rules, regulations and ordinances, which apply to work performed.

D. Each internal combustion engine used on the job or related to the job, shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated without said muffler.

E. Noise levels for scrapers, pavers, graders and trucks shall not exceed 90 dBA at 50 feet as measured under the noisiest operating conditions. For other equipment, noise levels shall not exceed 85 dBA. Equipment that cannot meet these levels shall be quieted by use of improved exhaust mufflers, noise attenuation barriers or other means.

F. Use electric or hydraulic tools whenever practical to reduce noise.

G. Provide notification of special circumstances or emergency conditions that require work beyond the hours specified as follows:
   1. Notify the Project Representative and local authority in advance of any proposed extended work hours for preauthorization. Include a written request for authorization per Section 01014 to perform work specified and the circumstances that warrant this request. Include any additional measures to mitigate noise generated by this construction activity if deemed necessary by the Project Representative.

2. If an emergency situation occurs that warrants extended hours, notify the Project Representative immediately upon determining the need for this work.

3.07 VIBRATION CONTROL AND SETTLEMENT CONTROL

A. Coordinate construction activities with business operations within the work corridor that may be sensitive to construction-related vibrations.

B. Limit construction activities around vibration-sensitive businesses or buildings. Where appropriate, use construction techniques that modify the propagation paths of the ground waves associated with vibration.

3.08 TREE AND PLANT PROTECTION

A. Unless specified to be removed, protect existing trees from damage by construction activities. Include a perimeter barrier fence (polyfence) at each tree, located at the dripline of the tree. Unless otherwise indicated, trees may not be removed without written approval from Project Representative. Unless otherwise indicated, if a tree is damaged or destroyed by construction, replace in species, size and grade with a healthy tree. Should it not be practical to replace the tree, pay for damages to trees in accordance with requirements of the private property owner or the County, as required by the Project Representative.

B. Minimize vegetation removal. Do not clear areas until construction activities require the work.

C. Restore stream banks, ditches, and natural watercourses promptly to minimize erosion.

3.09 WATER CONTROL

A. Do not divert storm drainage or sewer flow through any portion of the sewer or any other facility until after that portion of the pipeline to be used has been field-acceptance tested in accordance with the specifications, and until approval from the Project Representative has been received.

B. Unless otherwise indicated, do not direct water from construction activities to the sewer during wet weather conditions.

C. Be responsible for control of all surface water, during both dry and wet weather, as it may affect the work.

3.10 WATER QUALITY PROTECTION AND STORMWATER CONTROL

A. Conform to the regulations and requirements of legally authorized surface water management agencies.

B. Contractor shall be responsible for the overflow of any storm drains resulting from the addition of flow from Contractor’s activities and any damages associated with such overflow.

C. Conduct operations in such a manner as to prevent sediment, construction equipment wash water, and other pollutants from reaching existing sanitary sewers, storm drains, wetlands, and surface waters.

D. Inspect and maintain Best Management Practices (BMPs) on a regular basis to assure continued performance of their intended function. Promptly repair all noncompliant BMPs. The Department of Ecology requires all on-site erosion and sediment control measures be inspected at least once every seven days and within 24 hours after any storm event of greater than 0.5 inches of rain per 24 hour period measured at SeaTac International Airport.

E. Since fresh, uncured concrete in direct contact with water is toxic to aquatic life, place all concrete in the dry, or within confined waters not being dewatered, and allow to cure a minimum of seven days before contact with water.

F. Prevent additional construction wastes such as paper, wood, garbage, sanitary wastes, and fertilizer, from leaving the site and entering waterways. Dispose of all debris on land in such a manner that it cannot enter a waterway or cause water quality degradation.

3.11 OIL SPILL PREVENTION AND CONTROL

A. Prevent, contain, and clean the spilling of oil, fuel, and other petroleum products used. Discharge of oil from equipment or facilities into State waters or onto adjacent land is not permitted and violates State Water Quality Regulations.

B. At a minimum, perform the following measures regarding oil spill prevention, containment and clean-up:
   1. Inspect fuel hoses, lubrication equipment, hydraulically-operated equipment, oil drums, and other equipment and facilities regularly for drips, leaks, or signs of damage, and maintain and store properly to prevent spills. Maintain proper security to discourage vandalism.
   2. Dike or locate all land-based oil and products storage tanks so as to prevent spills from escaping into the water. Line dikes and subsoils with impervious material to prevent oil from seeping through the ground and dikes.
   3. Immediately contain all visible floating oils with booms, dikes, or other appropriate means and remove from the water prior to discharge into state waters. Immediately contain all visible oils on land using dikes, straw bales, or other appropriate means and remove using sand, ground clay, sawdust, or other absorbent material, and properly dispose of waste materials. Temporarily store waste materials in drums or other leak-proof containers after clean-up and during transport to disposal. Dispose of waste materials off property at a legal site.
   4. In the event of any oil or product discharges into public waters, or onto land with a potential for entry into public waters, immediately notify the following agencies at their listed 24-hour response numbers:
      a. WDOE, Northwest Regional Office: (425) 649-7000.
      b. U.S. Coast Guard: (206) 286-5540.
   5. As a minimum, maintain at each work site, and restock as necessary to ensure an adequate and continuous supply, the following materials:
      a. Oil-absorbent booms: 4 each, 5 feet long.
      b. Oil-absorbent pads or bulk material, adequate for coverage of 200 square feet of surface area.
      c. Oil-skimming system, if appropriate.
      d. Hay bales.
      e. Oil absorbent material, such as kitty litter or sawdust, for material spills on land, gloves for use when performing the work and plastic bags to collect the used material.

3.12 FINES

A. Contractor shall be responsible for all fines incurred from non-compliance with regulations of governing authorities.

END OF SECTION

SECTION 01570

TRAFFIC REGULATION

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the requirements for Traffic Control Plans, Notification schedules, temporary barricades, signs, flaggers, lights, road surfaces, detours, and maintenance thereof; and other safeguards necessary to protect life, health and safety.

1.02 QUALITY ASSURANCE

A. Referenced Standards: This Section incorporates by reference the latest revisions of the following documents. They are part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of the listed documents shall prevail.

Reference	Title
MUTCD	U.S. Department of Transportation, Federal Highway Administration: Manual on Uniform Traffic Control Devices, Part VI "Work Zone Traffic Control Standards and Guidelines"

1.03 SUBMITTALS

A. Procedures: Section 01300.

B. Traffic control plans: Submit to the Project Representative and ***Agency*** a minimum of 20 days prior to needed use for review and approval.

C. Notification schedules.

D. Submit separate Traffic Control Plans and Traffic Control Notification Plan.

1.04 TRAFFIC CONTROL REQUIREMENTS

A. Work crews should not impact two consecutive street intersections at the same time. Multiple construction crews are allowed.

B. Maintain pedestrian and bicycle access at all times.

C. Traffic flow on streets where work is not being performed shall not be revised.

D. Minor arterial streets shall be maintained in each direction at all times.

E. Identify specific streets which the Contractor determines will have a traffic impact.

F. Unless otherwise indicated, provide for passage and access of emergency vehicles, police, fire, and disaster units at all times. Assume liability for damages resulting from failure to provide said access.

G. Use off-duty police officers when affecting normal traffic operation at a signalized intersection.

H. Pedestrian routing on streets where the work is not being performed shall not be revised.

I. Annotate proposed location of barricades, lighting, signing, temporary striping and other traffic control devices.

J. Show access to buildings, emergency exiting, or property within and immediately adjacent to construction site.

K. Anticipate traffic, bus zone and driveway relocation resulting from construction operations. Include anticipated loss of bus, passenger and truck loading zones.

L. Provide location of on street parking.

M. At each site where a two-way roadway is restricted to one lane of alternating two-way traffic, provide a minimum of two certified flaggers in order to ensure safe and effective planning of traffic through the constricted zone. Provide three certified flaggers when the construction zone length causes sight distance or communication problems between a two member team of flaggers to operate safely.

N. Lane restrictions for specific roadways shall be the following unless otherwise approved by the jurisdiction in writing:
   1. Maintain two way traffic 7-9 a.m. and 4-6 p.m. weekdays. Each traffic lane shall be at least 12 feet in width.
   2. Maintain one lane with flaggers at all other times. Lane shall be at least 12 feet in width.

O. Contractor shall provide a minimum of one week written notice when driveway access will be restricted. Provide cleared residential driveway access at the end of every work day. Provide businesses, public service buildings, and industrial sites driveway access during their operating hours.

P. Notify both the applicable Police Department and the Fire Department of street closures.

Q. Within the construction zones, provide parking restriction easels a minimum of 24 hours in advance of the need to clear parking. Keep parking restrictions to a minimum.

R. Use an off-duty, uniformed police officer during working hours in the construction zone when signalized intersections are affected by construction to direct traffic, countermand the traffic signal and if necessary, to clear traffic backups. This officer is not for the convenience of the Contractor but rather to facilitate traffic movements.

S. Provide local access to all businesses, industrial sites and residences. Contractor shall provide a certified flagger to prevent any conflicts between local access traffic and construction crews and/or heavy equipment whenever local access is required into/out of the construction zone.

T. Provide road closure plans and provide for the type of traffic impacted. Contractor shall provide design of the detour route for local access.

U. Provide traffic cones or concrete barriers to separate traffic flow from construction work.

V. Channel traffic flow into the work zone per approved Traffic Control Plan.

W. Provide a temporary 5-foot wide alternate pathway on the same side of the street when construction interferes with the usual pedestrian/cyclist pathways. Keep pedestrian/ cyclist, vehicles and open excavations along the arterial all separate from one another to meet safety requirements. Maintain minimum of three crosswalks at all affected intersections.

1.05 JOB COORDINATION

A. Coordinate construction to offer the least possible obstruction and inconvenience to public.

B. Coordinate with property and business owners in order to maintain convenient access for local traffic to private properties along the line of work at all times and/or as specified in Paragraph 01570-3.02 and on the Drawings.

C. Keep existing street lighting systems in operation during progress of the work at all times.

D. Do not open up sections of work and leave them unfinished. Finish work in process insofar as practicable.

E. Have under construction no greater length or amount of work than can be prosecuted properly with due regards to the rights of the public.

F. Coordinate revisions to existing traffic control with the affected agencies. Keep traffic controls in operation, unless otherwise required by the Project Representative, for the benefit of the traveling public during progress of the work.

G. As work progresses and as conditions permit, reset temporarily relocated or removed traffic and street name signs in their permanent location. Replace or repair signs and other traffic control devices damaged or lost.

1.06 TRAFFIC CONTROL NOTIFICATION PLAN

A. Submit a Traffic Control Notification Plan within 14 days of the effective date of the Notice to Proceed and update for weekly Contract meetings a Notification Schedule to maintain access for adjacent or affected properties and businesses.

B. Traffic Control Notification Plan and Schedule shall include:
   1. Name of affected business/property owner.
   2. Mailing address of business or property owner.
   3. Address of affected property if different.
   4. Contact name and phone number.
   5. Estimated week of construction within 150 feet of affected property.
   6. Estimated number of days that construction will be fronting the property.
   7. Special issues for maintaining access.

C. Request and obtain written approval from the Project Representative and the appropriate jurisdictional agency before partially or completely closing any street.

D. Notifications regarding work performed in street areas shall be in such detail as to give the time of commencement and completion of the work, names of streets to be closed, schedule of operation, routes of detours, etc.

E. To accommodate emergency vehicle rerouting, notify in writing, local fire and law enforcement authorities and other affected agencies not less than 72 hours prior to construction operations which deviate or delay traffic from the existing traffic patterns.

F. Notify the bus agencies at least 72 hours in advance of any construction that may disrupt transit service or park and ride operations. Cooperate with bus agencies and assist in the relocations of the bus stop locations when access is prevented to existing bus stop locations during the construction.

G. Notification of the residents living adjacent to the work will be by the County two weeks in advance of the construction in the area of work.

H. The Contractor shall place door hangers, provided by the Project Representative, to directly inform individual household residents at least 48 hours in advance of beginning the work to minimize or eliminate inconveniences to the public. Inform household residents of work which will block the use of the property in any way.

PART 2 PRODUCTS

2.01 SIGNS

A. Provide signs with messages as part of the Traffic Control Plan as required to properly convey information to the motorist or pedestrian. Be responsible for installing and maintaining these signs. Signs shall be in accordance with the requirements of the standards referenced in Paragraph 01570-1.02, or as required by the business or property owner.

B. Signs: 24 inches wide by 36 inches high, free standing, with lettering large enough to be visible for 150 feet.
   1. Readable from two directions.
   2. Sign "message" to be coordinated with property owner and submitted to Project Representative prior to fabrication.

PART 3 EXECUTION

3.01 TRAFFIC MAINTENANCE

A. Take necessary measures to maintain a normal flow of vehicular and pedestrian traffic to prevent accidents and to protect the work throughout the construction stages until completion of the work. Make necessary arrangements to reroute traffic, provide and maintain barriers, cones, guards, barricades, and construction warning and regulatory signs. Regulatory devices provided by the Contractor shall be suitable for nighttime operation. Take effective measures necessary to protect other portions of the work during construction and until completion. This includes providing and maintaining necessary barricade lights, construction signs, guards, temporary crossovers, and flaggers in accordance with the standards referenced in Paragraph 01570-1.02.

B. Maintain emergency exiting from homes and businesses within and immediately adjacent to construction site.

C. Maintain vehicular traffic at all locations to the greatest extent possible and reduce and reroute traffic only for the shortest time possible consistent with effective construction operations. Required travel lanes shall not be blocked by the Contractor's activities, including trucks delivering materials unless approved by the Project Representative. Material deliveries and other related trucking activities shall occur in the Contractor's protected work or staging areas. Upon completion of a segment of work in streets, traffic shall be restored to normal flow as soon as possible. Maintenance of existing directional operation of street systems shall be maintained as much as possible.

D. When pavement markings are obliterated due to construction activities or pavement restoration, temporary pressure sensitive pavement marking tape, traffic buttons or delineators shall be installed where designated by the Project Representative. These temporary features shall be removed only upon installation of permanent traffic channelization.

E. Maintain access by emergency vehicles at all times in all roadways. Use temporary covers over cuts to accommodate traffic. Notify the Project Representative and the fire chief prior to limitation of access in any section of the roadway.

F. Maintain pedestrian movements through construction areas. Facilities for pedestrians includes provisions for the safe movement of mobility and sight-impaired individuals. This includes temporary ramps.

3.02 ACCESS

A. Unless otherwise indicated, provide local access at all times.

B. Maintain access to private properties and businesses at all times including the work area; if access is required in the immediate work area, make provision in the Contractor operations to provide requested access. Comply with the conditions of Paragraphs 01570-1.04,-1.05 and -1.06.

C. Where, during some urgent stages of construction, the Project Representative concurs that temporary closure of an access to a property is unavoidable, coordinate the closure with the property owner and provide alternative access, if required. The existing access shall not be closed until the replacement access is available.

D. When it is necessary to close the adjacent property, restore or provide interim access as soon as possible. Arrange schedules so that access is available to properties daily when work is not occurring.

3.03 SAFETY

A. Use adequate safeguards, safety devices and protective equipment and take other needed actions to protect life, health and safety and to protect property in connection with the performance of the work.

B. Use flaggers, signs, and other devices, and erect and maintain barricades, guards, signs, warning signs, and detour signs, as are necessary to warn and protect the public at all times from injury or damage as a result of the Contractor's operations, which may occur on streets affected by such operations.

C. Where flaggers are employed, the flaggers equipment and training shall be in accordance with the applicable laws and regulations. All required equipment shall be used by flaggers while actually flagging traffic

D. All flaggers are required to possess a current flagging certification card.

E. Provide standard signs as well as other appropriate signs prescribed by the Project Representative as applicable and necessary for the work. Erect signs on posts and supports and maintain them in a neat and presentable condition until the necessity for them has ceased. When the need for a sign has ceased, the Contractor, upon approval by the Project Representative, shall take down such sign. Control signs necessary for nighttime traffic control, or remaining in place during the night, shall be fully reflectorized.

F. Safeguard and direct traffic after the existing signs have been removed. Preservation and maintenance of traffic control and street name signs shall be the sole responsibility of the Contractor.

G. Provide and maintain temporary and permanent pavement markings including traffic markers, delineators, thermoplastic stop bars and crosswalks to meet the ***Agency*** current standards.

H. When required by the Project Representative, provide flaggers immediately; provide, erect, maintain and remove barricades and lights; and erect, maintain and remove standard signs.

I. In the event traffic signal or beacon is made inoperative by or at the request of the Contractor, provide an off-duty police officer as per laws and regulations, or provide suitable traffic control devices for control and movement of traffic during the time that the signal or beacon is inoperative.

J. Provide traffic control during the hours of construction and in a safe, prudent, operating manner. During the hours of non-construction, maintain all existing traffic lanes safe for vehicular traffic. Leave all unfinished work in a safe, non-hazardous condition to the public.

3.04 SIGNS

A. Check daily each item including weekends and holidays. Replace signs that are missing, vandalized, damaged, or not functioning properly within 24 hours of such act.

B. Non-applicable signs shall be removed or covered during periods not needed.

3.05 CONSTRUCTION AND MAINTENANCE OF DETOURS

A. Construct, maintain in a safe condition, and keep open to traffic detours that will accommodate traffic diverted from the roadway during construction.

B. Provide for all on-site or off-site detours required or necessitated by the work, including side street crossings, and temporary bridges over excavation or freshly placed concrete.

C. Keep roadways clean to assure the safe passage of pedestrians and vehicles.

END OF SECTION

NTS: MAKE CHANGES AS APPROPRIATE FOR THE TYPE OF WORK TO BE PERFORMED IN THE CONTRACT.

SECTION 01710

FINAL CLEANING

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the final cleaning on the work performed or effected by the work prior to completion of punch list items.

1.02 PURPOSE

A. The purpose of the cleaning is to clean up from the construction which occurred during the work of this Contract.

B. The site shall be maintained at the highest level of readiness and cleanliness. Take due care that materials purchased under this contract remain undamaged and free of dust and dirt at all times.

1.03 CLEANING REQUIREMENTS

A. Cleaning consists of performing a wipe down with a wet towel and cleaning solvent as appropriate for the item being cleaned.

B. Clean all items effected by the work and ensure they are free of dust, dirt, stains, damage, or defects.

C. Wash, sweep, polish, or otherwise clean all new and existing finished wall surfaces, floors, windows, hardware, mirrors, lighting fixtures, and items of equipment.

D. Replace damaged, defaced, or marred items.

PART 2 PRODUCTS

2.01 CLEANING MATERIALS

A. Use cleaning materials and processes recommended by the manufacturers of the surfaces to be cleaned.

PART 3 EXECUTION

3.01 CLEANING

A. Use experienced workers or professional cleaners.

B. Remove dirt, stains, labels and foreign materials.

C. Broom clean paved surfaces.

END OF SECTION

SECTION 01720

RECORD DRAWINGS

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies requirements for record drawing preparation, side sewer permit record drawings, updating, submittal, and payment.

B. Related sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 01310: Progress Schedules and Reports.
   2. Section 01062: Permits and Easements.

1.02 SUBMITTALS

A. Procedures: Section 01300.

B. One neatly and legibly marked set of full-size record drawings.

C. Completed Agency Side Sewer Permit cards, one for each side sewer relined or repaired.

PART 2 PRODUCTS

2.01 GENERAL

A. The record drawing set shall be kept separate from other construction drawings and shall not be used for other purposes.

B. Use waterproof red felt-tip pens to make fully dimensional changes on the drawings. Notations are to be neat, legible, clear and concise. Show changed dimensions by striking through the planned dimension with a single line and by placing the new value within a circle.

C. Show the actual as-built location along with all changes made during construction.

2.02 DRAWING REQUIREMENTS

A. Provide additional drawings or mark on the Drawings to show the following:
   1. Underground utilities and other items including the location of lines and appurtenances. Show the actual size and types of material used. Show locations by facility coordinates or dimensioned to permanent surface structures. Minimum requirements for accuracy as specified in the following table:

Description	Location	Elevation	Notes
Temporary Facilities and Construction Materials left at end of Contract	CL +/-1 ft	CL +/-1 ft	Includes shoring, all underground items, and concrete.
Pressurized piping.	CL +/-1 ft	CL +/-0.50 ft	Includes water and process lines.
Storm drains and sewer lines.	CL +/-1 ft	CL +/-0.01 ft	Recalculate slope if shown on the Dwgs.
Sewer interceptors and trunks.	Coordinates, stations, and offsets. CL +/-1 ft.	IE +/-0.50 ft.	Recalculate actual slopes.
Laterals and Side Sewers	CL +/-1 ft	CL +/-0.50 ft	Include measurements based on fixed objects

			(i.e. house corners)

CL = Centerline
IE = Invert Elevation
ft = Feet

2. The actual arrangement and routing of embedded conduit and piping is relative to its location and proportion to other work. The location does not need to be dimensioned or drawn to scale.
3. Other Drawings as may be required in the Specifications.
4. Provide dimensions from more than one permanent structure where required for accurate location.

2.03 CAD DRAWINGS

A. When Contractor drawings are prepared using computer-aided drafting (CAD) record drawings shall be provided both in electronic format (3-1/2-inch, 1.44 meg floppy disk or CD-R) and on half size prints. Electronic format shall be AutoCAD 2000 or newer.

2.04 SIDE SEWER PERMIT RECORD DRAWINGS

A. Contractor shall coordinate requirements for the Agency Side Sewer Permit per Section 01062. Comply with requirements for creating and submitting record drawing (as-built) cards.

PART 3 EXECUTION

3.01 PROGRESS

A. Record information concurrently with the progress of construction and maintain current on a weekly basis.

B. No work shall be concealed until the required information is recorded. Accurate recording of buried utilities and structures shall be confirmed by the Project Representative prior to backfilling.

C. The status of record drawings shall be determined for each progress payment. No payment will be made for the Contract work if record drawings are not current or complete for the billing period.

3.02 RECORDING CHANGES

A. Record information on the Drawings for the following conditions:
   1. Actual dimensions, arrangement, and materials used when different than shown on the Drawings.
   2. Changes made by Change Order or Field Directive.
   3. Changes made by the Contractor.

3.03 RECORD DRAWING PAYMENT

A. As a condition of progress billing payment release, keep the record drawings up to date for all work completed through the Application for Payment period.

B. Record drawings shall be complete prior to submittal.

C. Record drawings will be reviewed and accepted prior to payment of the assigned amount.

END OF SECTION

SECTION 01740

GUARANTEES

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies Contractor responsibilities and procedures to guarantee the work under this Contract. Requirements below are supplementary to those stated in Section 00700. Specific guarantees beyond the one year guarantee are indicated in the individual Specification sections.

1.02 DETERMINATION OF GUARANTEE DATES

A. The guarantee date(s) shall be established as indicated in Section 00700 upon Final Acceptance.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 DOCUMENTATION

A. Guarantee dates and the durations of the guarantee period shall be recorded and submitted on the Guarantee Documentation Form 01740-A in Section 01999.

B. The guarantee information shall be documented by Specification section in the same order as presented in the operations and maintenance manuals.

C. Vendor information including point-of-contact, company name, company address, and company emergency phone number shall be included for applicable equipment and components of the facility.

3.02 GUARANTEE RESPONSE

A. The Project Representative shall be the point-of-contact for response to guarantee-related issues during the one year guarantee period and the newly established guarantee periods per Paragraph 01740-3.02D.

B. For special guarantees extending beyond the one year guarantee period, King County personnel will contact the appropriate vendor directly, as identified on the Guarantee Documentation Form.

C. Upon notification of need for guarantee response, provide written notification to the King County initiator, indicating scheduled time of response, so that King County personnel may be scheduled to be on hand to provide assistance, and witness the response and/or repair. Guarantee work may only be undertaken on Mondays through Fridays, from 8:00 AM to 5:00 PM, unless the Contractor is given written consent for the performance of the work at other times.

D. Guarantee items requiring response within the guarantee period, will have a completely new guarantee period established from the time of repair. Upon completion of the repair, provide written verification of the newly established guarantee period to the Project Representative.

END OF SECTION

SECTION 01999

STANDARD FORMS

PART 1 GENERAL

1.01 SUMMARY

A. The forms listed below and included in this Section are referenced from other Sections of the Contract Document:

Form No.	Title
01063-A	Monthly Contractor Injury Summary Report
01300-A	Submittal/Transmittal Form
01300-B	Substitution Request Form
01740-A	Guarantee Documentation Form
01999-A	Standard Form

1.02 SCOPE

A. Be responsible for the documentation forms for tests and evaluations required of the Contract that do not have specific forms identified.

B. Contractor-generated forms shall follow the format established on Form 01999A contained herein.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

01063-A MONTHLY CONTRACTOR INJURY SUMMARY REPORT

Contract Name: _____

Contract No: _____ Month: _____

Contractor: _____

OSHA RECORDABLE CASES

WORK GROUP	NUMBER OF CASES	
	Reporting Month	Year-to-Date
Hourly Employees		
Supervisory Personnel		
TOTAL		

LOST TIME ACCIDENTS

WORK GROUP	NUMBER OF CASES		LOST WORKDAYS	
	Reporting Month	Year-to-Date	Reporting Month	Year-to-Date
Hourly Employees				
Supervisory Personnel				
TOTAL				

TOTAL HOURS WORKED AT CONTRACT SITE

Reporting Month	
Year-to-Date	

INCIDENT AND SEVERITY RATE

Date of last lost-time accident: _____

Number of hours worked since last lost-time accident: _____

$$\text{Incident Rate} = \frac{\text{Total Number of OSHA Recordable Cases x 200,000}}{\text{Total Hours Worked at King County Project Site}}$$

$$\text{Severity Rate} = \frac{\text{Total Number of Lost Workdays x 200,000}}{\text{Total Hours Worked at King County Project Site}}$$

RATES	Reporting Month	Year-to-Date
Incident Rate		
Severity Rate		

KING COUNTY

Date Stamp

[Name of Project]

Submittal No. _____

Date _____

Contract Number: CXXXXXC

Resubmittal ☐

Previous submittal No. _____

01300-A Submittal/Transmittal

Subcontractor or Supplier: _____

This section to be completed by Contractor.						This Section to Be Completed By King County	
Item No.	**P/C**	**Spec. Paragraph**	**Contractor's Cat. or Dwg. No.**	**Description of Item**	**Copies Submit**	**Review Action**	**Contractor Deviation**

Contractor certifies to Review of Submittal, Verification of Field Measurements & Compliance with Contract Documents

By: Date:

Remarks :

Legend-Review Action

1 No exceptions taken ☐
2 Note Markings ☐
3 Comments Attached-Confirm ☐
4 Comments Attached-Resubmit ☐
5 Rejected ☐

P - Partial
C- Complete

Distribution:	By (Print)	Date
Initial Review Completed		
Project Representative		
Returned To Contractor		

Project Representative's review is for general conformance with the Contract. Markings or comments shall not relieve the Contractor from compliance with the Contract.

The Contractor remains responsible for details and accuracy, for confirming and correlating all quantities and dimensions, for selecting fabrication processes, for techniques of assembly and for performing its work in a safe manner.

Project Representative Review	Routing	Initial	Date
No Exceptions Taken ☐			
Note Markings ☐			
Rejected ☐			
Comments Attached ☐			

Response Required of Contractor	Construction Division Use Only	
	Reviewed Copies To:	Date
Confirm ☐	Constr. Division Files	
	Resident Engineer	
	Contractor Proj. Eng.	
Resubmit ☐		

FORM 01300-B **SUBSTITUTION REQUEST FORM**

TO: _____

CONTRACT NO. CXXXXXC: CONTRACT NAME: _____

We hereby submit for your consideration the following item instead of the specified item or procedure:

Section	Paragraph	Specified Item
_____	_____	_____

Proposed Substitution:

_____
_____
_____

Attach complete data, including laboratory tests, if applicable. Include complete information on changes to Contract Drawings and/or Specifications which proposed substitution would require for its proper installation.

Fill in blanks below:

A. How will substitution affect dimensions shown on Drawings?

_____

_____

B. What effect does the substitution have on the Baseline Schedule?

_____

_____

C. State quality and performance differences between proposed substitution and specified item or procedure.

_____

_____

_____

D. List the cost differences between proposed substitution and specified item or procedure. (Attach estimate/quote and indicate net change).

_____

_____

E. List manufacturer's name and address, trade name of product, and model or catalog number.

_____

_____

_____

F. Other information as required by the Project Representative.

_____

_____

_____

G. The undersigned states that the function, appearance and quality of the proposed substitution are equivalent or superior to those of the specified item and authorizes the payment to the County for all design changes including Project Representative, detailing, and County processing costs.

_____

_____

H. The undersigned states that there is a waiver of all claims for additional costs related to the substitution which may subsequently arise during the work.

_____

I. Manufacturer's guarantees the proposed and specified items are:

_____ Same _____ Different (explain on attachment)

Submitted by:

_____
Contractor Signature

_____
Firm

_____
Address

_____

Date: _____

Telephone: _____

For use by Project Representative

____ Accepted ____ Accepted as Noted

____ Not Accepted ____ Received Too Late

By: _____

Date: _____

Remarks: _____

FORM 01740-A
GUARANTEE DOCUMENTATION FORM **Page _____ of _____**

Contract Number:_____

System, Equip., or Area ID:	START DATE	END DATE	Contact:	Company:	Phone:

General Contractor Representative | Project Representative | Date

King County
Wastewater Treatment Division
Department of Natural Resources
201 South Jackson Street
Seattle, WA 98104-1596

Project: _____

Contract Number: _____ Date: _____

Title: _____

SECTION 02105

SEWER BYPASSING

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the requirements for all temporary bypassing and dewatering of sewers.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 01560: Environmental Controls.
   2. Section 01570: Traffic Regulation.

1.02 SUBMITTALS

A. Procedures: Section 01300.

B. Submit drawings and complete design data showing methods and equipment that the Contractor proposes to utilize at all locations for use in sewer bypassing and dewatering. The submittal shall include the following information:
   1. Drawings indicating the location of temporary sewer plugs and bypass discharge lines.
   2. Capacities of pumps, prime movers, and standby equipment.
   3. Design calculations proving adequacy of the bypassing system and selected equipment.
   4. Traffic control plan per Section 01570.
   5. Sewer Service Interruption Notification Plan.
   6. Acoustical information to confirm noise control compliance per Section 01560.
   7. Emergency Cleanup Plan including the name and phone number of emergency cleanup subcontractor and industrial hygienist.

1.03 JOB CONDITIONS

A. Protection:
   1. Where bypassing is required, ensure that location of connecting laterals and side sewers are identified and service is not disrupted, unless noted otherwise.
   2. Discharge all bypassed flow as approved by the Project Representative.
   3. No bypassing to the ground surface, receiving waters, or which results in groundwater contamination or potential health hazards shall be permitted.
   4. Monitor upstream and downstream manholes for flow backup and obstructions.

B. Do not shut down the bypassing and dewatering systems between shifts, on holidays or weekends, or during work stoppages without permission from the Project Representative.

C. Contractor shall schedule work or provide for sewer service operations to allow businesses to operate during their normal hours of operation. Contractor to coordinate with businesses and submit data as part of the Sewer Service Interruption Notification Plan in Section 02105-1.04.

D. Bypass operations shall not occur between the hours of 6 pm Friday to 7 am Monday. Sanitary sewer shall be restored to all residences during this time.

1.04 SEWER SERVICE INTERRUPTION NOTIFICATION PLAN

A. Update as necessary for the weekly Contract meetings and include the addresses of affected business/property owners and the estimated dates that sewer service will be interrupted.

B. Submit a Sewer Service Interruption Notification Plan within 14 days of the effective date of the Notice to Proceed and update for weekly Contract meetings a Notification Schedule to maintain sewer service for adjacent or affected properties and businesses.

C. Notification Plan and Schedule shall include:
   1. Address of affected property.
   2. Estimated week of service interruption of affected property.
   3. Special issues for maintaining sewer service, if applicable.

D. Request and obtain written approval from the Project Representative and the ***Agency*** before interrupting sewer service.

E. Initial notification of the residents living adjacent to the work will be by the County in advance of the construction in the area of work.

F. The Contractor shall place door hangers, provided by the Project Representative, to directly inform individual household residents at least 48 hours in advance of beginning the work to minimize or eliminate inconveniences to the public. Inform household residents of work which blocks the side sewer service connection, or shuts down the potable water system.

G. Notifications regarding work performed shall be in such detail as to give the time of commencement and completion of the work.

H. On the day that sewer service is interrupted, the Contractor shall notify in person, each residence or business served by the sewer. The occupant(s) shall be advised that sewer service will be interrupted and the occupant(s) are to refrain from discharge to the sewer. The notification shall provide the estimated time of service restoration. The Contractor shall maintain a record of the residences and businesses that were visited, the time of the visit, and whether or not personal contact was made with the occupant(s).

1.05 EMERGENCY CLEANUP PLAN

A. Submit an Emergency Cleanup Plan within 14 days of the effective date of the Notice to Proceed.

B. The plan shall include provisions for an industrial hygienist and a standby subcontractor for the cleanup of exterior and building interior spaces that might be affected by a spill or overflow. The plan shall be subject to the requirements of Section 01063.

C. The industrial hygienist and the cleanup subcontractor shall be certified by the Institute of Inspection Cleaning and Restoration (IIRC) and follow the Standard and Reference Guide for Professional water damage Restoration IICRCS500 for the cleanup of Category-3 Gray/Black Water.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 SEWER PIPE DEWATERING

A. Completely dewater portions of the sewer or pressure grout where proposed pipe relining, new pipe connection, or service connection is to occur.

3.02 SEWER BYPASSING

A. Accomplish sewer bypassing by routing the contributing flow away from the Contractor's work.

B. Carefully coordinate construction activities with National Weather Service Forecasts to reduce the probability of high flows and/or surcharging from stormwater during construction.

C. Bypass pumping shall be done in such a manner as not to damage private or public property, or create a nuisance or public menace. The pumped sewage shall be in an enclosed hose or pipe that is adequately protected from traffic, and shall be redirected into the sanitary sewer system. Dumping or free flow of sewage on private property, excavations, gutters, streets, sidewalks, or into storm sewers is prohibited.

D. Take all necessary precautions including constant monitoring of bypass pumping, and at a minimum monitor the manhole immediately upstream of the bypass lateral to ensure that no private residences or properties are subjected to a sewage backup or spill. The Contractor shall be liable for all cleanup, damages, and resultant fines in the event of a spill. After the work is completed, flow shall be restored.

E. Equipment:
   1. Provide temporary pumps, conduits, and other equipment necessary to bypass the sewer flow.
   2. Furnish the necessary labor and supervision to set up and operate the pumping and bypass system.
   3. Pumps and bypass lines shall be of adequate capacity and size to control the flows.
   4. Install Contractor's equipment in a manner that shall not cause sewers to surcharge during maximum flows.
   5. Monitor all operating pumps 24 hours per day.

3.03 STANDBY EQUIPMENT

A. Maintain on-site:
   1. Sufficient equipment and materials to ensure continuous and successful operation of the bypass and dewatering systems.
   2. A sufficient number of valves, tees, elbows, connections, tools, sewer plugs, piping and other parts or system hardware to ensure immediate repair or modification of any part of the system as necessary.

B. Keep standby pumps fueled and operational at all times.

C. If electric pumps are being used, make standby generators available to ensure continuity of the pumping operation in the event of a power failure.

D. Sewage spill containment equipment.

3.04 RESTORATION AND REPAIR

A. Repair any damage that may result from inadequate or improper design, installation, maintenance and operation of bypassing and including mechanical or electrical failures. Restore areas affected by bypassing systems.

B. Cleanup shall be in accordance with the approved Emergency Cleanup Plan.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies the definition, design, responsibilities, operation, maintenance, removal, and execution of dewatering.

B Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
1. Section 01195: Protection and Maintenance of Property and Work.
2. Section 01560: Environmental Controls.
3. Section 02200: Earthwork.
4. Section 02221: Trenching, Backfilling, and Compaction.

C. Dewatering is anticipated to be limited to removal of surface water and groundwater seepage from excavations using sumps. Installation of dewatering wells for groundwater control is not anticipated.

1.02 SUBMITTALS

A. Procedures: Section 01300.

B. Drawings and complete design data:
1. Proposed methods and equipment for utilization in:
   a. Dewatering.
   b. Control of sediments.

1.03 DESIGN REQUIREMENTS

A. Limit dewatering efforts to localized areas for specific structures. Large area dewatering will not be permitted.

B. Approval by the Project Representative of the drawings and data submitted shall not in any way be considered to relieve the Contractor from full responsibility for errors therein.

C. Discharge of sediment laden water to storm drainage systems, sanitary sewer, ditches, or natural watercourses is not permitted. Provide settling tanks or filters as required, to prevent sediment discharge.

D. Dewatering can affect improvements in the work area. Take adequate precautions in the design and implementation of the dewatering plan to protect existing improvements, and avoid damage thereto.

E. The dewatering discharge requirements shall not exceed the maximum allowable limits of the Washington State Water Quality Standards in WAC 173-201A.

1.04 PERMIT

A. The dewatering discharge requirements shall not exceed the maximum allowable limits in the King County Authorization to Discharge to the Sanitary Sewer in Section 01062 and the Washington State Water Quality Standards in WAC 173-201A when applicable.

NTS: REVISE AS APPROPRIATE DEPENDING ON WHETHER A KING COUNTY AUTHORIZATION TO DISCHARGE TO THE SANITARY SEWER HAS BEEN ISSUED FOR THE PROJECT.

B. Daily reports shall be submitted summarizing the self-monitoring requirements listed in the Industrial Waste Discharge Authorization included in Section 01062.

C. Comply with all Dewatering Permit and Waste Discharge Permit requirements.

D. Conform with all monitoring, reporting, and other permit requirements related to dewatering.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.01 GENERAL

A. Provide, operate and remove any and all additional machinery, appliances and equipment necessary to keep excavations free from water during construction. Dewater and dispose of the water so as not to cause injury to public, private, or other property, or to cause a nuisance or a menace to the public. At all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outage and flooding, and have available at all times for the continuous and successful operation of the dewatering systems. These systems shall not be shut down between shifts, on holidays, or weekends, or during work stoppage without written permission from the Project Representative.

B. The control of groundwater shall be such that softening of the bottom of excavations, or formation of "quick" conditions or "boils" during excavation shall be prevented. Design and operate dewatering systems to prevent removal of the natural soils.

C. During excavating, constructing structures, installing pipelines, placing gravel working base, structure and trench backfill, the placing and setting of concrete, and excavations shall be kept free of water. Control surface runoff so as to prevent entry or collection of water in excavations or in other isolated areas of the site. The dewatering system shall be designed using accepted and professional methods of design and engineering consistent with the best modern practice. The dewatering system shall include any sumps, and other equipment, appurtenances, and related earthwork necessary to perform the function. Visit the site to determine the existing conditions thereof.

D. Be solely responsible for proper design, installation, proper operation, maintenance, and any failure of any component of the dewatering system for this Contract.

E. Perform all testing or pumping as required to assure a properly functioning dewatering system.

3.02 DISCHARGE POINTS

A. Discharge points shall meet the requirements of the King County Authorization to Discharge to the Sanitary Sewer in Section 01062.

NTS: REVISE AS APPROPRIATE DEPENDING ON WHETHER A KING COUNTY AUTHORIZATION TO DISCHARGE TO THE SANITARY SEWER HAS BEEN ISSUED FOR THE PROJECT.

B. Discharge points shall be to the sanitary sewer only. Discharge points shall be determined by Contractor during the course of the work and shall be approved by the ***City of Lake Forest Park*** prior to dewatering.

3.03 ELECTRICAL SUPPLY FOR INSTALLATION OF DEWATERING SYSTEMS

A. Supply the electrical service used for dewatering separate from all other Contractor electrical requirements and dedicated solely to the operation of the dewatering systems.

3.04 DEWATERING SYSTEM PROTECTION

A. Take all reasonable precautions necessary to ensure continuous, successful operation of the system. This includes adequate marking of all pump and pipeline locations.

B. Wherever dewatering discharge lines shall be crossed for access and egress, use steel ramps to protect the system from vehicular traffic. All ramps shall be capable of supporting the heaviest equipment on site and shall provide at least 1 foot of clearance between the dewatering system element and the underside of the ramp.

C. All ramped pipelines shall be valved on both sides of the ramp. Routings affecting normal site operations, including regular vehicular traffic patterns within, into and out of the site, shall be approved before installation.

3.05 STANDBY EQUIPMENT

A. Maintain on site sufficient equipment and materials to ensure continuous and successful operation of the dewatering systems.

B. Manifold each diesel or electrically-powered centrifugal pump to a diesel pump of equal or greater performance capability.

C. Cause standby pumps to be fueled and operational at all times.

D. Test daily all standby centrifugal pumps and generators to ensure their immediate availability.

E. Maintain on site a minimum of 60 feet of each size and type of header or discharge pipe used in the system.

F. Maintain on site a sufficient number of valves, tees, elbows, connections, tools, recorder charts and parts or other system hardware to ensure immediate repair or modification of any part of the system as necessary.

3.06 DAMAGES

A. Repair any damage to work in place, other contractors' equipment, and the excavation, including damage to the bottom due to heave and removal of material and pumping out of the excavated area, that may result from negligence, inadequate or improper installation, maintenance and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system at no additional cost to King County.

3.07 MAINTAINING EXCAVATION IN DEWATERED CONDITION

A. Maintain the dewatering systems in operation at all times.

B. Maintain the system at all times.

C. Provide personnel skilled in the operation, maintenance, and replacement of system components, standby and spare equipment of the same capacity and quantity, and any other work required to maintain the systems.

D. Dewatering shall be a continuous operation and interruptions due to outages or any other reason shall not be permitted. Be responsible for all damages to accepted work in the excavation area and for damages to any other area caused by its failure to maintain and operate the system as specified above.

3.08 SOIL TEST DATA

A. Use of available soil test information in no way relieves the Contractor from its responsibility for design, construction, and operation of a properly functioning dewatering system.

1. No soil test data is provided by the County for this project.

3.09 SYSTEM REMOVAL

A. Decommissioning:
   1. Dispose of all dewatering pumps, pipes and other assorted system hardware.
   2. After decommissioning, landscape each affected area to match the surrounding environment (e.g., grass, pavement concrete, unclassified fill, etc.).

END OF SECTION

SECTION 02160

EXCAVATION SUPPORT SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies requirements for excavation support systems of trenches and open excavations greater than four feet in depth.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 01195: Protection and Maintenance of Property and Work.
   2. Section 02200: Earthwork.
   3. Section 02221: Trenching, Backfilling, and Compaction.

1.02 QUALITY ASSURANCE

A. Referenced Standards: This Section incorporates by reference the latest revision of the following document. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and that of the listed document, the requirements of this Section shall prevail.

Reference	Title
WAC 296-155	Washington Safety Standards for Construction Work
WAC 296-155 Part N	Excavation, Trenching, and Shoring

1.03 SUBMITTALS

A. Procedures: Section 01300.

B. Design documents including detailed excavation support drawings and installation and removal plan and sequencing. Provide information required by the Washington Safety Standards for Construction Work (WAC Chapter 296-155 Part N).

1.04 DESIGN REQUIREMENTS

A. The design, planning, installation, and removal, of all sheeting, shoring, sheet piling, lagging, and bracing shall be accomplished in such a manner as to maintain the required excavation or trench section and to maintain the undisturbed state of the soils below and adjacent to the excavation.

B. Design sheeting, shoring and bracing in accordance with WAC 296-155 Part N.

C. Horizontal strutting below the barrel of a pipe and the use of pipe as support are not acceptable.

1.05 SUPPORT SYSTEM REQUIREMENTS

A. Submit design calculations and method of installation and removal of all sheeting, sheet piling, shoring, and bracing. Said submittal will be to assure the County of the Contractor's general compliance with the references and shall not be construed as a detailed analysis for adequacy of the support system, nor shall any provisions of the above requirements be construed as relieving the Contractor of its sole responsibility and liability for the work.

B. Information to be provided shall include the following:
   1. Design calculations and method of installation and removal of all sheeting, sheet piling, shoring, and bracing. Calculations shall be stamped and signed by a structural or civil engineer licensed in the State of Washington and shall comply with applicable requirements of the Washington State Safety Code and the rules of the WISHA Department of Labor and Industries with respect

to excavation and construction.
2. Detailed support drawings.

C. Comply with applicable requirements of the Washington State Safety Code and the rules of the WISHA Department of Labor and Industries with respect to excavation and construction.

D. When the construction sequence of structures requires the transfer of bracing to portions of any new structure or to any existing structure, provide a complete design analysis of the expected impact of that bracing on the structure. This action shall in no way absolve the Contractor of responsibility of damage resulting from said bracing.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 GENERAL

A. Construct the excavation support systems in such a manner as not to disturb the state of soil adjacent to the trench or excavation and below the excavation bottom.

B. Unless otherwise indicated, remove all sheet piling, sheeting, shoring, bracing and other necessary supports after placement and compaction of backfill.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies earthwork which consists of excavation, material, backfilling, compacting, and grading.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 01410: Inspection and Testing.
   2. Section 01560: Environmental Controls.
   3. Section 02140: Dewatering.
   4. Section 02160: Excavation Support Systems.
   5. Section 02221: Trenching, Backfilling, and Compacting.
   6. Section 02513: Asphalt Paving.

1.02 QUALITY ASSURANCE

A. Referenced Standards: This Section incorporates by reference the latest revision of the following document. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and that of the listed document, the requirements of this Section shall prevail.

Reference	Title
AASHTO T176	Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3(2,700 kN-m/m^3))
ASTM D2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D2922	Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D3017	Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM E329	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

B. Tests:
   1. Project Representative will take samples and perform moisture content, gradation, compaction, and density tests during placement of backfill materials to check compliance with the Specifications.
      a. Remove surface material at locations designated by the Project Representative and provide such assistance as necessary for sampling and testing.
      b. Project Representative may request that the Contractor construct trenches for inspection in compacted or consolidated backfill to determine per ASTM D2922 that the Contractor has complied with the Specifications.
      c. Testing by the Project Representative does not relieve the Contractor of its responsibility to determine to its own satisfaction when and if its work meets the Specifications.
      d. Tests will be made in accordance with ASTM E329 in accordance with the following:

Test	Standard Procedure
Moisture content	ASTM D3017, ASTM D2216
Gradation	ASTM C136, ASTM D476
Density in-place	ASTM D2922
Moisture-density relationships	ASTM D1557

1.03 SUBMITTALS

A. Procedures: Section 01300.

B. Laboratory test reports of fill materials to be used, certifying:
   1. Moisture density relationships and gradation test reports and curves.
   2. Gradation tests for non-cohesive materials.

1.04 DEFINITIONS

A. Compaction: the degree of compaction is specified as percent compaction. Maximum or relative densities refer to dry soil densities obtainable at optimum moisture content.

B. Excavation slope: defined as an inclined surface formed by removing material from below existing grade.

C. Embankment slope: defined as an inclined surface formed by placement of material above existing grade.

D. Imported backfill: defined as select material which meets the Fill Class specified and is obtained from a supplier regularly engaged in the business of supplying soil/fill material. It is not material which is obtained from any excavation.

PART 2 MATERIALS

2.01 FILL MATERIALS

A. Type A (Pit Run):
   1. Select granular material free from organic matter.
   2. Sand equivalent value of not less than 20.
   3. Conform to the following gradation:

U.S. Standard Sieve Size	Percent by Weight Passing
3 inch	100
1-1/2 inch	95-100
No. 4	35-80
No. 10	10-70
No. 40	0-50
No. 100	0-30
No. 200	0-5 (wet sieving)

   4. The coefficient of uniformity shall be three or greater.
   5. The material may be an imported quarry waste, clean natural sand or gravel, select trench excavation, or a mixture thereof.

B. Type N (Imported Trench Backfill):
   1. Free of stones greater than 2-1/2 inches in the greatest dimension, free from clay and organic matter, moisture content that is less than the material's optimum value, and compacts readily.
   2. Conform to the following gradation:

U.S. Standard Sieve Size	Percent by Weight Passing
2-1/2 inch	100
1/4-inch	25 min
No. 200	10 max

Dust ratio	% Passing No. 200	2/3 max
	% Passing No. 40	

C. Type O (Controlled Density Fill, CDF): as specified in Section 03310.

D. Type P (Crushed Surfacing Base Course): as specified in Section 02513.

E. Type R (Crushed Surfacing Top Course): as specified in Section 02513.

F. Type S (Bedding Material for Rigid Pipe):
   1. Crushed, processed, or naturally occurring granular material. It shall be essentially free from various types of wood waste or other extraneous or objectionable materials.
   2. Characteristics of size and shape that compacts readily.
   3. A maximum of five percent shall pass the No. 200 sieve for sanitary sewer installations.
   4. Conform to the following for grading and quality:

U.S. Standard Sieve Size	Percent by Weight Passing
1 inch	100
1/4-inch	25-80
No. 200	7 max
Sand Equivalent	30 min

G. Type U (Bedding Material for Flexible Pipe):
   1. Clean sand/gravel mixture free from organic matter and conforming to the following gradation:

U.S. Standard Sieve Size	Percent by Weight Passing
3/4-inch	100
3/8-inch	70-100
No. 4	55-100
No. 10	35-95
No. 20	20-80
No. 40	10-55
No. 100	0-10
No. 200	0-3

PART 3 EXECUTION

3.01 GENERAL

A. Control of water:
   1. Keep excavations free from water during construction.
   2. Disposal of water: per Sections 01560 and 02140.

B. Overexcavation:
   1. Where the undisturbed condition of natural soils is inadequate for support of the planned construction, overexcavate to adequate supporting soils.
   2. Fill the excavated space to the specified elevation with class of backfill shown on the Drawings or per Table A if not shown.
   3. Unless otherwise specified, the overexcavated space under footings and structures shall be filled with Type A.

C. Excavated material:
   1. Unless otherwise specified, suitable excavated material (fill) shall be stockpiled for reuse.
   2. Dispose of unsuitable excavated materials, such as peat, off-site.
   3. Ensure that there is sufficient material for the completion of the Contract before disposing of material off site. Replace material caused by premature disposal of material.
   4. Dispose of surplus excavated material off-site in accordance with applicable ordinances and environmental requirements.
   5. Imported material shall not be stockpiled within 25 feet of any excavation or structure.
   6. Use construction methods which preserve the stability of the soil adjacent to the excavation.
   7. Protect materials stockpiled for reuse from wind or rain erosion by covering with tarps or other

effective methods.

8. Suitable excavated native material shall be protected in order to prevent moisture contamination. Stockpiled material which becomes contaminated with moisture beyond its allowable moisture content for placement as fill shall be removed and disposed of and replaced with Imported Backfill at the expense of the Contractor.

D. Borrow material: If the quantity of acceptable material from the excavation is not sufficient for backfill required by the work, the quantity of material needed to complete the Contract shall meet Table A requirements. Stockpiled import material shall be protected in order to prevent moisture contamination. Stockpiled import material which becomes contaminated with moisture beyond its allowable moisture content for replacement as fill shall be removed and disposed of and replaced with suitable import material at the expense of the Contractor.

E. Hauling and Haul Roads: per Section 01500.

F. Finish grading:
   1. Finished surfaces shall be smooth, compacted, and free from irregularities. The degree of finish shall be that normally obtainable with a blade-grader.
   2. Finished grade shall be as specified by the contours +0.10-foot, except where a local change in elevation is required to match sidewalks, curbs, manholes, and catch basins, or to ensure proper drainage.
   3. When the work is an intermediate stage of completion, the lines and grades shall be as specified +0.5-foot to provide adequate drainage.

G. Control of erosion: maintain earthwork surfaces true and smooth, and protected from erosion. Where erosion occurs, provide fill or excavate as necessary to return earthwork surfaces to the grade and finish specified.

3.02 CLASSIFICATION OF FILL

A. Fill material shall be placed in horizontal layers and compacted with power operated tampers, rollers, idlers, or vibratory equipment.

B. Material type, maximum layer depth, relative compaction, and general application are specified in Table A below.

C. Unless otherwise specified, fill classes shall be used where specified in Table A under general application.

TABLE A - FILL CLASSIFICATIONS

Fill Class	Material Type	Uncompressed Max. Layer Depth Inches	Minimum Compaction Percent	General Application
A	A	8	95	Backfill in all roadways and under structures.
N	N	8	90	Imported trench backfill to replace unsuitable excavated materials.
S	S	6	95	Bedding for rigid pipes.
U	U	6	95	Bedding for flexible pipes.

3.03 EARTHWORK FOR PIPELINES AND CONDUITS

A. Per Section 02221.

3.06 FINISH

A. Areas covered by the work, including excavated and filled sections and transition areas, shall be graded uniformly to match existing grade.

B. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes.

C. The degree of finish shall be that ordinarily obtainable from a blade-grader operation.

D. The finish surface shall be not more than 0.2 feet above or below the established grade.

E. Ditches shall be finished to drain readily.

F. The surface of areas to be paved on which a base course is to be placed shall not vary more than 0.05 feet from established grade and cross section.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies requirements for trenching, backfilling, and compacting of trenches for pipeline and utility work.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 02140: Dewatering.
   2. Section 02160: Excavation Support Systems.
   3. Section 02200: Earthwork.
   4. Section 03310: Controlled Density Fill.

1.02 SUBMITTALS

A. Procedures: Section 01300.

PART 2 MATERIALS

2.01 BEDDING

A. Unless otherwise indicated, all bedding shall meet the requirements of Section 02200.

B. Controlled density fill used for pipe bedding shall comply with the requirements as specified in Section 03310.

2.02 BACKFILL

A. Trench backfill shall comply with Section 02200.

PART 3 EXECUTION

3.01 TRENCHING

A. Trench excavation shall be unclassified.

B. The terms "earthwork" or "excavation" include all materials excavated or removed regardless of material characteristics.

C. Provide free access to all fire hydrants, water valves, and meters. Leave clearance to enable the free flow of stormwater in all gutters, conduits and natural watercourses.

D. Remove all ledge rock, boulders and stones 4 inches and larger to provide a minimum clearance of 12 inches under and around the pipe.

E. Replace all excavated material with fill material that meets the requirements of Section 02200.

F. In loose or soft soils, perform the excavation at the bottom of the trench by equipment that does not have digging teeth. Should the natural or fill foundation soils at the trench bottom be disturbed or loosened because of the Contractor's operations, re-compact or remove. If material is removed, refill the area with material as specified in Section 02200.

G. Excavate all trenches in accordance with the existing alignment and grade of the existing sewer. Typical trench sections with maximum and minimum dimensions are shown on Drawings.

H. Excavation as required to construct new manhole in the same location as existing manholes and maintain the same pipe inverts and grades as existing pipes.

NTS: REVISE THE ABOVE TWO PARAGRAPHS IF NEW PIPING AND MANHOLES ARE NOT FOLLOWING GRADE AND ALIGNMENT OF EXISTING FACILITIES.

3.02 PIPE FOUNDATIONS

A. Inadequate Soils:
   1. Where the undisturbed condition of the natural soil material is inadequate for support of the planned pipeline repair, the Project Representative will direct the Contractor to over-excavate to adequate supporting soils.
   2. Fill the excavated space to maintain existing pipe grade with backfill per Section 02200.

B. Foundation Preparation:
   1. Properly prepare the foundation and place the foundation material prior to installation of all pipe bedding and pipe.
   2. This shall include the necessary preparation of the native trench bottom and/or the top of the foundation material to a uniform grade so that the entire length of pipe rests firmly on a suitable properly compacted material.
   3. Place bedding and backfill material around the pipe in a manner to meet requirements specified in the respective section for the type of pipe being installed.

3.03 PIPE BEDDING

A. Placement of bedding material in the pipe zone shall be as indicated on the Drawings or as specified in the section regarding the type of pipe being constructed.

3.04 BACKFILLING

A. Complete pipe bedding and initial backfill as shown on the Drawings before subsequent backfilling operations are started.

B. Take all necessary precautions to protect the pipe from any damage, movement or shifting. In general, perform backfilling by placing the material so as not to damage the pipe.

C. Provide for the proper maintenance of traffic flow and accessibility as may be necessary, and make adequate provisions for the safety of property and persons.

D. Unless specifically authorized in writing by the Project Representative, remove temporary cribbing, sheeting or other timbering.

E. Keep pipe placed below the water table from floating by lowering the water level in accordance with Section 02140.

F. Remove all brush, stumps, logs, planking, disconnected drains, boulders, etc. from the material to be used for backfilling the trench.

3.05 GENERAL COMPACTION REQUIREMENTS

A. Refer to Table A of Section 02200 for compaction requirements.

B. Equipment:
   1. Provide the proper size and type of compaction equipment and select the proper method of utilizing said equipment to attain the required compaction density.

2. In all cases, select and use equipment so as to not damage the pipe or other utilities and structures.
3. Truck-mounted drop hammers or truck-mounted impact hammers, impact pavement breakers, and similar types of mobile equipment will not be permitted for compacting backfill placed around or above pipes.

C. Water settling methods of compaction shall not be permitted.

D. In-place compaction tests may be made by the Project Representative as specified in Paragraph 02200-1.02B. Remove and re-compact material that does not meet specified requirements.

END OF SECTION

SECTION 02513

ASPHALT PAVING

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies asphalt concrete and aggregate base for pavement.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 01410: Inspection and Testing.
   2. Section 02200: Earthwork.

1.02 QUALITY ASSURANCE

A. Referenced Standards: This Section incorporates by reference the latest revision of the following document. These references are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and that of the listed document, the requirements of this Section shall prevail.

Reference	Title
AASHTO M17	Mineral Filler for Bituminous Paving Mixtures
AASHTO MP1	Standard Specification for Performance Graded Asphalt Binder
AASHTO T48	Flash and Fire Points by Cleveland Open Cup
AASHTO T49	Standard Test Method for Penetration of Bituminous Materials
AASHTO T 209	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM C131	Test Method for Resistance to Degradation of Small-Size Coarse Aggregate
ASTM D1557	Test Method for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54 kg) Rammer and 18-in. (457 mm) Drop
ASTM D2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

1.03 SUBMITTALS

A. Submit the following data per Section 01300:
   1. Technical data of asphalt to be used for tack coat.
   2. Technical data of asphalt to be used in paving mix.
   3. Gradation data for asphalt concrete aggregates and aggregate base materials.
   4. Manufacturer's qualifications.

B. Present the following data to the Project Representative prior to placement:
   1. Truck load tickets for aggregate base and asphalt concrete at the time of delivery.

1.04 JOB CONDITIONS

A. Unless otherwise approved by the Project Representative, do not place asphalt concrete when the ambient temperature of the ground is below 50 degrees F, the subgrade soils or base is saturated, or when it is raining.

PART 2 PRODUCTS

2.01 AGGREGATE BASE COURSE AND CRUSHED SURFACING

A. Crushed surfacing shall be manufactured from ledge rock, talus, or gravel. The materials shall be uniform in quality and substantially free of wood, roots, bark, and other extraneous material and shall meet the following test requirements:

Los Angeles Wear, 500 Rev.	35% max.
Degradation Factor — Top Course	25 min.
Degradation Factor — Base Course	15 min.

B. Crushed surfacing of the various classes shall meet the following requirements for grading and quality when placed in hauling vehicles for delivery to the roadway, or during manufacture and placement into a temporary stockpile:

Sieve Size	Base Course Percent Passing[1]	Top Course and Keystone Percent Passing[1]
1-1/4 square	100	
3/4 square		100
5/8 square	50-80	
1/4 square[3]	30-50	55-75
U.S. No. 40	3-18	8-24
U.S. No. 200	7.5 max.	10.0 max.
% Fracture[2]	75 min.	75 min.
Sand Equivalent	32 min.	32 min.

1. All percentages are by weight.
2. The fracture requirement shall be at least one fractured face and will apply to material retained on each specification sieve size U.S. No. 10 and above if that sieve retains more than 5 percent of the total sample.
3. The portion of crushed surfacing retained on a 1/4-inch sieve shall not contain more than 0.15 percent wood waste.

2.02 TACK COAT GRADE

A. Asphalt: Asphalt for tack coat shall be cationic emulsified asphalt grades CRS-2 or STE-1.

B. Cationic Emulsified Asphalt:

Cationic Emulsified Asphalt

Type	Rapid Setting				Medium Setting						Slow Setting				Special Tack	
Grade	CRS- 1 Min.	Max	CRS- 2 Min.	Max.	CMS- 2S Min.	Max.	CMS- 2 Min.	Max.	CMS- 2h Min.	Max.	CSS- 1 Min.	Max.	CSS- 1h Min.	Max.	STE- 1 Min.	Max.
Tests on Emulsions:																
Viscosity Saybolt Furol S @ 77 F (25 ° C)	—	—	—	—	—	—	—	—	—	—	20	100	20	100	—	30
Viscosity Saybolt Furol S @ 122 F(50 ° C)	20	100	150	400	50	450	50	450	50	450	—	—	—	—	—	—
Storage stability test 1 day %	—	1	—	1	—	1	—	1	—	1	—	1	—	1	—	1
Demulsibility 35 ml 0.8% sodium dioctyl sulfosuccinate, % [a]	40	—	40	—	—	—	—	—	—	—	—	—	—	—	25	—
Coating ability & water resistance:																
Coating, dry aggregate	—	—	—	—	Good	—	Good	—	Good	—	—	—	—	—	—	—
Coating, after spraying	—	—	—	—	Fair	—	Fair	—	Fair	—	—	—	—	—	—	—
Coating, wet aggregate	—	—	—	—	Fair	—	Fair	—	Fair	—	—	—	—	—	—	—
Coating, after spraying	—	—	—	—	Fair	—	Fair	—	Fair	—	—	—	—	—	—	—
Particle charge test	Pos		Pos		Pos		Pos		Pos		Pos [b]		Pos [b]		Pos	

Sieve Test, %	—	0.10	—	0.10	—	0.10	—	0.10	—	0.10	—	0.10	—	0.10	—	0.10
Cement mixing test, %	—	—	—	—	—	—	—	—	—	—	—	2. 0	—	2. 0	—	—
Oil distillate by vol. of emulsions %	—	3	1.5	3	—	20	—	12	—	12	—	—	—	—	—	5
Residue, %	60	—	65	—	60	—	65	—	65	—	57	—	57	—	45	—
Tests on residue from distillation tests:																
Penetration, 77 F (25 ° C)	100	250	100	250	100	250	100	250	40	90	100	250	40	90	100	200
Ductility, 77 F (25 ° C) 5 cm/ min., cm	40	—	40	—	40	—	40	—	40	—	40	—	40	—	40	—
Solubility in trichloroethylene, %	97.5	—	97.5	—	97.5	—	97.5	—	97.5	—	97.5	—	97.5	—	97.5	—

[a] The demulsibility test shall be made within 30 days from date of shipment.

[b] If the particle charge for test CSS-1 and CSS- 1h is inconclusive, material having a maximum pH value of 6.7 will be acceptable.

2.03 ASPHALT CONCRETE MIX

A. Paving Asphalt: Asphalt cement for paving shall be either performance graded PG 58-22 or PG 64-22 meeting the requirements of AASHTO MP1, or viscosity grade AR-4000W as follows:

	Viscosity Grade	
Characteristics	**AR-4000W**	**AR-2000W**
Absolute Viscosity at 140 F, poise	2500-5000	2500-5000
Kinematic Viscosity at 275 F cSt, min.	275	200
Penetration at 77 F 100g/5 sec, min.	40	50
Percent of original penetration at 77 F min.	45	40
Ductility at 45 F (1 cm/min.) cm. min.	10	20
Test on Original Asphalt		
Flashpoint (Cleveland Open Cup) F min.	440	425
Solubility in Trichloroethylene, % min.	99.0	99.0

B. Aggregates:
   1. General:
      a. Aggregates for asphalt concrete shall be manufactured from ledge rock, talus, or gravel. The material from which they are produced shall meet the following test requirements:
         Los Angeles Wear, 500 Rev. 30% max.
         Degradation Factor, Wearing Course 30 min.
         Degradation Factor, Other Courses 20 min.
      b. It shall be uniform in quality, substantially free from wood, roots, bark, extraneous materials, and adherent coatings. The presence of a thin, firmly adhering film of weathered rock will not be considered as coating unless it exists on more than 50 percent of the surface area of any size between consecutive laboratory sieves.
      c. Aggregate removed from deposits contaminated with various types of wood waste shall be washed, processed, selected, or otherwise treated to remove sufficient wood waste so that the oven-dried material retained on a 1/4-inch square sieve shall not contain more than 0.1 percent by weight of material with a specific gravity less than 1.0.
   2. Test Requirements:
      a. Aggregate for asphalt concrete shall meet the following test requirements:
         1) Sand Equivalent: Minimum 37 percent by weight.
         2) Fracture: The fracture requirements are at least one fractured face on 90 percent of the material retained on each specification sieve size U.S. No. 10 and above, if that sieve retains more than 5 percent of the total sample.
      b. When material is used from a stockpile that has not been tested as provided above, the requirements for fracture and sand equivalents shall apply at the time of its introduction to the cold feed of the mixing plant.
      c. The properties of the aggregate in a preliminary mix design for asphalt concrete shall be such that, when it is combined within the limits set forth in Paragraph 02513-2.03.C and mixed in the laboratory with the designated grade of asphalt, mixtures with the following test values can be produced:

Stabilometer Value	37 minimum
Cohesiometer Value	100 minimum
Percent Air Voids	2-4.5
Modified Lottman Stripping Test	Pass

3. Gradation: The Contractor may furnish aggregates for use on the same contract from a single stockpile or from multiple stockpiles. The gradation of the aggregates shall be such that the completed mixture complies in all respects with the pertinent requirements of Paragraph 02513-2.03.C. Acceptance of the aggregate gradation shall be based on samples taken from the final mix.
4. Blending Sand: In the production of aggregate for asphalt concrete, there is often a deficiency of material passing the U.S. No. 40. When this occurs, blending sand in an amount specified by the Project Representative may be used to make up this deficiency, provided that a satisfactory final mix is produced, including fracture requirements. Blending sand shall be clean, hard, sound material, either naturally occurring sand or crusher fines, and must be material which will readily accept an asphalt coating. The exact grading requirements for the blending sand shall be such that, when it is mixed with an aggregate, the combined product shall meet the requirements of Paragraph 02513-2.03.C for the class of material involved. Blending sand shall meet the following quality requirement:

   Sand Equivalent: 27 minimum

5. Mineral Filler: Mineral filler, when used in ACP mix, shall conform to the requirements of AASHTO M 17.

C. Proportions of Materials:
1. The materials of which asphalt concrete is composed shall be of such sizes, gradings, and quantities that, when proportioned and mixed together, they will produce a well graded mixture within the requirements listed in the table which follows.
2. The percentages of aggregate refers to completed dry mix, and includes mineral filler when used.

	Grading Requirements	
Sieve Size	**Percent Passing**	**Tolerance**
3/4" square	100	-1%
5/8" square	—	—
1/2" square	90-100	—
3/8" square	75-90	—
1/4" square	46-66	—
U.S. No. 4	—	± 6%
U.S. No. 8	—	—
U.S. No. 10	30-42	± 5%
U.S. No. 40	11-24	± 4%
U.S. No. 200	3.0-7.0	± 2%

3. For asphalt concrete produced using recycled asphalt materials and placed in areas other than the wearing course of the traveled lane, the gradation for the U.S. No. 200 sieve is revised as follows:

	Maximum Passing 0.075 mm
50%-60% Recycled Material	8.0%
61%-70% Recycled Material	9.0%

D. Manufacturer Qualifications: Manufacturer shall be a paving-mix manufacturer registered with and approved by King County DOT or WSDOT.

2.04 ASPHALT TREATED BASE COURSE

A. Liquid asphalt per Paragraph 02513-2.03.

B. Aggregate shall be top course per Paragraph 02513-2.01B.

C. Anti-Stripping Additive:
   1. Heat-stable and anti-stripping additive shall be added to the asphalt mix.
   2. The anti-stripping additive can be either added to the liquid asphalt or sprayed on the aggregate on the cold feed.
   3. When liquid anti-stripping additive is added to the liquid asphalt, the amount shall not exceed 1 percent by weight of the liquid asphalt.
   4. When polymer additives are sprayed on the aggregate, the amount shall not exceed 0.67 percent by weight of the aggregate.

2.05 TEMPORARY PAVEMENT PATCH (COLD MIX)

A. Asphalt: MC 250.

B. Mineral Aggregate: Conforming to Paragraph 2.01B for top course.

PART 3 EXECUTION

3.01 SUBGRADE

A. Before any paving is placed, the Contractor shall bring the subgrade to the required line, grade and cross-section using suitable native soils or gravel borrow free of wood waste and other unsuitable materials. The Contractor shall compact the subgrade to a depth of 6 inches to 95 percent of the maximum density as determined by ASTM D1557 and ASTM D2922. If the subgrade is too soft to permit proper compaction, the Contractor shall loosen, aerate, (or remove and replace with gravel borrow), and compact the subgrade as specified. The compacted area must be wide enough to let paving machines operate without visible distortion.

B. Maintain the subgrade in the required condition until the pavement is placed. The Contractor may remove material just before paving if the plans require thicker areas of pavement.

3.02 AGGREGATE BASE

A. In preparing the roadbed for aggregate base, the Contractor shall:
   1. Remove from the roadbed, immediately before placing surfacing materials, all brush and debris.
   2. Dispose of all debris.
   3. Drain water from all low spots or ruts.
   4. Shape the entire subgrade to a uniform surface running reasonably true to the line, grade and cross-section.
   5. Compact the aggregate base materials to a depth of 4 inches, minimum. Compaction shall achieve 95 percent of the maximum density as determined by ASTM D1557 and ASTM D2922.
   6. Remove and dispose of excess material that does not drift to low spots during blading and shaping, by placing it where the subgrade lacks material or by wasting it.

3.03 TACK COAT

A. A tack coat of asphalt, applied at the rate of 0.02 to 0.08 gallons per square yard of retained asphalt, shall be applied by a mechanical distributor, approved by the Project Representative, to all surfaces on which any course of asphalt concrete is to be placed, including prior to leveling course. The distributor equipment shall be capable of distributing asphalt uniformly over an area in controlled amounts and shall be equipped with hand operated spray equipment for use only on inaccessible and irregularly shaped areas.

B. Where the new asphalt concrete abuts a curb or gutter, cold pavement joint, trimmed meet line, or any metal surface, a thin tack coat of asphalt shall be applied on the vertical face of the abutting surface by hand painting prior to paving. The application on the contact surfaces shall be thin and uniform in order to avoid an accumulation of excess asphalt in puddles. The Contractor shall not apply the back coat on vertical contact surfaces above the finished height of the asphalt concrete being place.

3.04 ASPHALT CONCRETE PAVEMENT

A. Asphalt Mixing Plant:
   1. Asphalt shall be heated to a maximum of 350 degrees F. When discharged, the temperature of the mix shall not exceed 325 degrees F. Mixtures held for more than 24 hours after mixing shall not be used.

B. Hauling:
   1. Hauling vehicles shall have smooth metal beds, treated to prevent the mixture from adhering to the bed. Loads shall be covered to protect the paving mixture from the weather. The asphalt concrete mixture shall leave the mixing plant at a temperature between 260 degrees F and 325 degrees F, and when deposited on the roadbed it shall have a temperature not less than 250 degrees F.
   2. Unless otherwise directed by the Project Representative, the construction of each course of asphalt concrete pavement shall commence at the point farthest away from the mixing plant and progress toward the plant so that no hauling will be done over freshly placed pavement.

C. Placing, Spreading and Strike-off:
   1. Comply with Paragraph 02513-1.04 regarding suitable weather conditions.
   2. The mixture shall be laid upon an approved base, spread and struck off to grade and elevation established. Unless otherwise approved by the Project Representative, self-contained, power-propelled asphalt paving machine(s) shall be used, capable of spreading and finishing courses of asphalt plant-mix in lane widths and to thicknesses specified and shown on the Plans. The paver shall be equipped with automatic screed controls with sensors for either or both sides of the paver. The screed or strike-off assembly shall effectively produce a finished surface of the specified evenness and texture without tearing, shoving, segregating, or gouging the mixture.

D. Compaction:
   1. Immediately after the asphalt concrete mixture has been spread, struck off, and surface irregularities adjusted, it shall be thoroughly and uniformly compacted. The completed course shall be free from ridges, ruts, humps, depressions, marks or other irregularities in compliance with the line, grade, and cross section.
   2. Compaction shall take place when the mixture is in the proper condition so that no undue displacement, cracking or shoving occurs. All compaction units shall be operated at the speed, within specification limits, that will produce the required compaction. Areas inaccessible to large compaction equipment shall be compacted by mechanical or hand tampers. Any asphalt concrete that becomes loose, broken, contaminated, shows an excess or deficiency of asphalt, or is in any way defective, shall be removed and replaced, at no additional cost, with fresh hot mix which shall be immediately compacted to conform with the surrounding areas.
   3. The internal temperature of the mixture shall not be less than 185 degrees F upon achieving density requirements in accordance with the applicable specification. Vibratory rollers shall not be used in the vibratory mode for surface finish work when the internal temperature of the mixture is below 175 degrees F. The type of rollers to be used and their relative position in the compaction sequence shall generally be at the Contractor's option provided specified densities are attained.
   4. The acceptable level of compaction shall be a minimum compacted density of 91 percent of the maximum density as determined by AASHTO T 209. The specified level of density attained shall be determined by the statistical evaluation of five nuclear density gauge tests taken on the day the mix is placed and compacted, at representative random locations selected by the Project Representative.

E. Surface Smoothness:

1. The completed surface of all courses shall be of uniform texture, smooth, uniform as to crown and grade, and free from defects of all kinds.
2. The completed surface of the wearing course shall not vary more than 1/8 inch from the lower edge of a 10-foot straight-edge placed on the surface parallel to the centerline.
3. The transverse slope of the completed surface shall vary not more than 1/4 inch in 10 feet from the rate of transverse slope shown on the Plans.
4. Defects in excess of these tolerances shall be corrected to the satisfaction of the Project Representative.

3.05 ASPHALT TREATED BASE COURSE

A. Provide mix design for review by the Project Representative.

B. The asphalt treated base shall be compacted to a density of not less than 80 percent of the maximum theoretical density established for the mix by AASHTO T-209.

C. The use of equipment which results in damage to the materials or produces substandard workmanship will not be permitted.

D. The temperature of the mixture at the time compaction is achieved shall be a minimum of 185 degrees F.

3.06 TEMPORARY PAVEMENT PATCH

A. Follow all trenching with trench restoration as closely as practical. Apply cold mix patch prior to opening pavement to traffic.

B. Be responsible for maintaining the cold mix patch and temporary pavement in a condition acceptable to the Project Representative and ***the Agency***. Be responsible for the cost of any repairs to the pavement.

C. Replace all asphalt pavement and crushed surfacing with permanent pavement per the Pavement Restoration details shown on the Drawings and per the Referenced Specifications.

D. No feathering shall be allowed. Paper joints shall be used.

E. Roadway elevations shall match pre-construction elevations.

END OF SECTION

NTS: THIS SECTION GENERALLY FOCUSES ON INSTALLATION OF PVC PIPE FOR LATERALS, SIDE SEWERS, SMALL DIAMETER SEWER MAINS AND CLEANOUTS. MODIFY SECTION ACCORDINGLY FOR OTHER MATERIALS AND LARGE DIAMETER MAINS.

SECTION 02610

SANITARY SEWERAGE

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes sanitary sewerage pipe, cleanouts, couplings, and fittings.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 02200: Earthwork.
   2. Section 02221: Trenching, Backfilling, and Compaction.

1.02 DEFINITIONS

A. PVC: Polyvinyl chloride plastic.

1.03 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: Not less than 150 psig.

1.04 SUBMITTALS

A. Procedures: Section 01300.

B. Shop Drawings: Include plans, elevations, details, and attachments for the following:
   1. Pipe, fittings and gaskets.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect pipe, pipe fittings, and seals from dirt and damage.

B. Do not store plastic structures, pipe, and fittings in direct sunlight.

PART 2 PRODUCTS

2.01 PIPES AND FITTINGS

A. PVC Sewer Pipe and Fittings:
   1. Conform to ASTM D3034, SDR 35.
   2. Joints shall conform to ASTM D3212 using a restrained rubber gasket conforming to ASTM F477.
   3. Fittings shall be injection molded tees or factory solvent welded saddle tees. Saddles fastened to pipe with external bands are not acceptable on any new system, unless specifically approved by the Project Representative.
   4. All PVC sewer pipe shall be considered flexible conduit.

2.02 COUPLINGS

A. Couplings:
   1. Fernco.
   2. DFW Non-Shear manufactured by NDS Inc.
   3. Romac Style 501.
   4. Approved Equal.

2.03 CLEANOUTS

A. Pipe and Fittings: Per Paragraph 02610-2.01.

B. Access: Screw on or gasketed PVC cap.

2.04 SNAP-ON SEWER CLEANOUT TEE

A. Snap-on sewer cleanouts shall consist of a one-piece PVC saddle that shall conform to an existing pipe by snap fit, LMK Vac-A-Tee or approved equal.

B. The saddle shall have a boss to accept the riser pipe.

C. Riser pipe and fittings: Per Paragraph 02610-2.01.

D. The saddle shall be adhered and sealed to the existing pipe using a two part epoxy.

NTS: THE CLEANOUT TEE SPECIFIED ABOVE IS AN OPTIONAL PRODUCT TO CONVENTIONALLY INSTALLED CLEANOUTS BY THE OPEN CUT METHOD. AS OF 2003, THE TEE IS LIMITED TO USE WITH EXISTING CONCRETE OR CLAY PIPE, AND HAS A VERY LIMITED NUMBER OF INSTALLERS. THE SPECIFICATION WAS ORIGINALLY INCLUDED ON PROJECTS WHERE LINING PRODUCTS BY LMK ENTERPRISES, INC. WERE TO BE USED.

PART 3 EXECUTION

3.01 EARTHWORK

A. Trenching, backfilling and compaction shall be as specified in Section 02221.

3.02 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Coordinate final location of piping and cleanouts with Project Representative.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

D. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated.
   1. Install piping pitched down in direction of flow, at minimum slope of 2 percent and maximum slope of 50 percent, unless otherwise indicated.

3.03 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to manufacturer's recommendations.

B. PVC Sewer Pipe and Fittings:
   1. Joints shall conform to ASTM D3212 using a restrained rubber gasket conforming to ASTM F477.

C. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.

D. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.04 CLEANOUTS

A. Provide cleanouts as shown on the Drawings.

3.05 SNAP-ON SEWER CLEANOUT TEE

A. Vacuum excavate bore hole up to 16 inches in diameter.

B. Vacuum truck spoils shall be disposed of offsite in accordance with local, state, and federal law.

C. Clean pipe, apply epoxy to the underside of the saddle in accordance with the manufacturer's requirements and install fitting on pipe.

D. Testing: Hydrostatically test the saddle by applying 6 feet of water column. The saddle shall hold the water column for a minimum of 5 minutes with no drop in water level.

E. Cut open the existing pipe to a minimum of 90 percent of the riser diameter after successfully tested.

NTS: SEE NTS FOR SECTION 02610-2.04.

3.06 CLEANOUT LOCATIONS AND INSTALLATION

NTS: REVISE THE FOLLOWING PARAGRAPH AS APPROPRIATE BASED ON SPECIFIC PROJECT CONDITIONS, REQUIREMENTS OF THE LOCAL AGENCY IN WHICH THE WORK IS BEING PERFORMED, AND ANTICIPATED INTERACTION WITH PRIVATE PROPERTY OWNERS WHERE CLEANOUTS ARE BEING INSTALLED.

A. Final cleanout locations shall be field located by the Contractor in coordination with the ***City of Redmond*** and the private property owner and the location shall be approved by the Project Representative before construction of the cleanout. The Contractor is encouraged, but not required, to find and utilize existing cleanouts wherever possible.

B. The drawings do not indicate all existing utilities. There may be existing buried utilities not indicated on the drawings, including but not limited to, phone, water, cable, fiber optic and power adjacent to anticipated cleanout locations. The Contractor shall coordinate location of the new cleanouts with all buried utilities and right of way constraints.

3.07 FIELD QUALITY CONTROL

A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
   1. Place plug in end of incomplete piping at end of day and when work stops.
   2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

B. Do not enclose, cover, or put into service before inspection and approval.

C. Low Pressure Air Test: The pipe system shall be low pressure air tested as follows:
   1. The test equipment to be used shall be approved by the Project Representative prior to use. The Project Representative may at any time require a calibration test of gauges or other instrumentation that is incorporated into the test equipment. Calibration tests shall be certified by an independent testing laboratory.
   2. Plugs used to close the pipe for the air test must be securely braced to prevent the unintentional release of a plug which can become a high velocity projectile. Gauges, air piping manifold, and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole or pit where a plugged pipe is under pressure. Air testing apparatus shall be equipped with a pressure release device, such as a rupture disk or a pressure relief valve, designed to activate when the pressure in the pipe exceeds 2 psig above the required test pressure.
   3. If the pipe to be tested is submerged by groundwater, the back pressure on the pipe created by the groundwater submergence must be determined. All gauge pressures described in the test shall be increased by that amount.
   4. The first section of pipe installed by each crew shall be tested in order to qualify the crew and material. A successful test for the section shall be a prerequisite to further installation by that crew.
   5. Air shall be slowly supplied to the plugged pipe section until the internal air pressure reaches 4 psig. Wait at least two minutes to allow for pressure and temperature stabilization to occur within the pipe.
   6. When the pressure decreases to 3.5 psig, the air pressure test shall begin. The test shall consist of measuring the time in seconds for the pressure in the pipe to drop from 3.5 psig to 2.5 psig. The pipe shall be considered acceptable if the time in minutes for the pressure drop is equal to or greater than the required time as calculated below:

      $K = 0.0111d^2L$
      $C = 0.0003918dL$

      If $C_T \leq 1$, then time = K_T
      If $1 < C_T < 1.75$, then time = K_T/C_T
      If $C_T \geq 1.75$, then time = K_T /1.75

      where: d = Pipe diameter (inches)
      L = Pipe length (feet)
      K = value for each length of pipe of a specific diameter
      C = value for each length of pipe of a specific diameter
      K_T = sum of all K values
      C_T = sum of all C values

D. For laterals where one end of the pipe cannot be plugged to facilitate air test, inspect interior of piping using CCTV recording methods to determine whether line displacement or other damage has occurred. Inspect after backfill is in place.
   1. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   3. Reinspect and repeat procedure until results are satisfactory.

END OF SECTION

SECTION 02650

PIPELINE AND MANHOLE CLEANING

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies cleaning of pipelines and manholes in preparation for rehabilitation.

B. Related sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 02105: Sewer Bypassing.
   2. Section 02651: Manhole Rehabilitation.
   3. Section 02652: Cure in Place Pipe (CIPP).
   4. Section 02653: Service Connection Rehabilitation Liner.
   5. Section 02656: Service Connection and Lateral Rehabilitation Liner.
   6. Section 02761: Television Inspection of Existing and Rehabilitated Sewers.
   7. Section 03600: Grout for Manholes.
   8. Section 09910: Coatings for Manholes.

PART 2 PRODUCTS

2.01 CLEANING EQUIPMENT

A. Equipment shall be capable of removing dirt, grease, rocks, sand, roots, and obstructions from lines and manholes.

PART 3 EXECUTION

3.01 PREPARATION

A. When using hydraulically propelled cleaning tools that depend upon water pressure to provide cleaning force, or tools that retard flow are used, take precautions to ensure that water pressure created does not damage or cause flooding of public or private property.

3.02 PIPELINE CLEANING

A. Equipment:
   1. Clean using hydraulically propelled equipment.
   2. Select equipment to be used based on conditions of lines at time work commences.
   3. Equipment and methods selected shall be satisfactory to the Project Representative.

B. Make minimum of two passes through pipe segment with cleaning equipment. Total number of passes shall be as necessary to provide full removal of all roots, dirt, grease, sludge and other objectionable materials from the entire inner surface of the pipe.

C. Begin cleaning at upstream end of system and proceed in downstream direction. Unless otherwise permitted by the Project Representative, cleaning of pipeline segments upstream of a section of pipe already cleaned will not be allowed.

D. Supply water for performing high-velocity hydro cleaning or flushing. If water is to be obtained from public water system, obtain approval from public water system authority prior to commencement of work.

E. Root Removal:
   1. Remove all roots from pipe being cleaned.
   2. Use mechanical equipment.

NTS: ADDITIONAL INFORMATION SHOULD BE ADDED TO THIS PARAGRAPH WHERE A HIGH DEGREE OF CLEANING EFFORT IS ANTICIPATED PRIOR TO REHABILITATION WORK, SUCH AS FOR EXTENSIVE ROOT INTRUSION. CONSIDER ADDING A UNIT COST ITEM TO THE BID DOCUMENTS WHERE EXTENSIVE CLEANING IS ANTICIPATED.

3.03 MANHOLE CLEANING

A. Manholes designated for rehabilitation shall be cleaned using water or steam as necessary prior to rehabilitation of the manhole.

B. Cleaning shall meet the minimum requirements of these specifications and the minimum recommendations of the manufacturer for the rehabilitation system being applied or installed.

C. Supply water for cleaning manholes.
   1. If water is to be obtained from public water system, obtain approval from public water system authority prior to commencement of work.

D. Root Removal:
   1. Remove all roots from manhole being cleaned.
   2. Use mechanical equipment.

3.04 SEWER BYPASSING

A. Meet the applicable requirements of Section 02105.

3.05 MATERIAL REMOVAL AND DISPOSAL

A. Sludge, dirt, sand, rocks, roots, grease, and other solid or semisolid material resulting from pipeline cleaning operation shall be removed at adjoining downstream manhole. Passing material to downstream pipe will not be permitted.

B. Material resulting from cleaning operations shall be retained in the manhole, unless otherwise allowed by the Project Representative. Material shall be retained on a screen in the invert of the manhole. The opening in the screen shall be such that any larger materials dislodged by the cleaning will be retained while allowing the water to pass through into the sewer. Remove and dispose of waste material.

C. Solids or semisolids resulting from cleaning operations shall be removed from site and disposed of in accordance with provisions of local, State, and Federal requirements. Remove materials from site at end of each workday. Do not accumulate debris onsite beyond a single workday, except in totally enclosed containers and as approved by the Project Representative.

3.06 VERIFICATION OF PIPELINE CLEANING

A. Demonstrate to the Project Representative results of cleaning effort. Provide verification by CCTV inspection, as specified in Section 02761. Preparation of the host pipe shall meet the requirements of the manufacture of the rehabilitation method being used. Reclean section if Project Representative determines section has not been adequately cleaned.

3.07 VERIFICATION OF MANHOLE CLEANING

A. Demonstrate to the Project Representative results of cleaning effort. Preparation of the manhole shall meet the requirements of the manufacture of the rehabilitation product being used. Reclean manhole if Project Representative determines manhole has not been adequately cleaned.

3.08 PROTECTION OF WORK

A. Maintain clean condition of pipes and manholes as necessary to allow completion of rehabilitation work.

END OF SECTION

SECTION 02651

MANHOLE REHABILITATION

PART 1 GENERAL

1.01 SUMMARY

A. This Section covers work, materials and equipment necessary for construction of miscellaneous rehabilitation work, including such items as installing pans under lids, grouting, coatings, barriers, paving rings, repair bands, re-alignment and adjustment of leveling rings, frames, and lids, etc., for the purpose of eliminating infiltration.

1.02 RELATED SECTIONS

A. The work of the following Sections are related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor ’s responsibility to perform all the work required by the Contract Documents.
   1. Section 03600: Grout for Manholes.
   2. Section 09910: Coatings for Manholes.

NTS: REVISE THE TWO PARAGRAPHS ABOVE BASED ON MANHOLE REHABILITATION WORK TO BE PERFORMED.

1.03 DEFINITIONS

A. Manhole barrel or wall: That portion of the manhole from the base to the bottom of the cone.

B. Pipe penetrations : That part of the manhole where a sewer main or lateral penetrates the wall of the manhole.

C. Cone: That part of the manhole above the wall that narrows the manhole diameter from the base diameter to the manhole frame diameter; for example, used to install a 24-inch frame on a 48-inch manhole. May be either precast concrete, brick, block, or a slab-top, and either concentric or offset.

D. Leveling rings or adjusting rings: That portion of the manhole between the top of the cone and the bottom of the frame, also known as the chimney. This part of the manhole is typically used to allow adjustment between the top of the cone and the final grade of the asphalt. May be cast-in-place or precast concrete, brick, or block.

E. Ladder: The means of accessing the manhole, either with a ladder anchored to the wall or rungs embedded in the wall. Typically made of cast iron, galvanized steel, or polyethylene.

F. Frame and Lid: The manhole entry, typically made of cast iron. Also referred to as frame and cover.

G. Joints: The interface between manhole sections. For example, the joints between pre-cast concrete components or the joints between the cone and the leveling rings. Existing joints may or may not include some type of gasket.

H. Seals: Those parts of the manhole where joints occur. These are typically covered with grout.

I. Manhole Pan: A stainless steel pan that fits under the lid and whose flange is sandwiched between the frame and the lid. Its purpose is to limit inflow through the lid or under the edges of the lid.

J. Paving rings : A cast-in-place concrete collar used in place of leveling rings.

1.04 SUBMITTALS

A. Procedures: Per Section 01300.

B. A list of materials proposed to be used under this Section shall be provided before materials are delivered to the shop and/or the jobsite. The list of materials shall include any of the products specified under this Section.
   1. For each product, provide the manufacturer's technical data sheets, and application instructions which shall include the following:
      a. Manufacturer's name and product name.
      b. Physical properties, tensile/compressive/flexural strength, volatile organic compound (VOC) content, etc.
      c. Surface preparation recommendations.
      d. Environmental controls and requirements.
      e. Application and installation requirements, and pot life.
      f. Material safety data sheets.
      g. ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications.

1.05 QUALITY ASSURANCE

A. Materials, supplies, and articles provided shall be the standard products of manufacturers. Coatings in a particular system shall be the products of a single manufacturer.

B. Contractor shall initiate and enforce quality control procedures consistent with applicable standards and the manufacturer's recommendations.

C. The Project Representative will observe preparation, installation and material handling procedures to ensure adherence to the specifications.

D. Certification by manufacturers: Provide a letter from the manufacturer and ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications

1.06 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to the job site in their original, unopened containers. Each container shall bear the manufacturer's name brand, batch number, date of manufacture, storage life, and special directions.

B. Coatings shall be stored in enclosed structures and shall be protected from weather and excessive heat or cold. Flammable materials shall be stored in accordance with state and local codes. Materials exceeding storage life recommended by the manufacturer shall be removed from the site. Protective coating materials are to be handled according to their material safety data sheets.

1.07 PROJECT SITE CONDITIONS

A. Traffic control: manholes are typically located in roadways or in easements. Contractor shall be responsible for traffic control plans, flagging, detours, signage, and all other traffic safety measures.

B. Sewers shall be maintained in service at all times. Contractor shall provide all necessary equipment and training necessary where confined space entry, flow diversion or bypass is necessary.

PART 2 PRODUCTS

2.01 GENERAL

A. Materials shall not be used until the Project Representative has inspected the materials and surface preparation. Surface preparation shall be as specified for each product.

2.02 MANHOLE PAN

A. The manhole pan (also referred to as manhole inserts) and components shall be manufactured of materials resistant to corrosion from atmospheres containing hydrogen sulfide and dilute sulfuric acid. Installed under the lid and fits between the frame and the lid. Install per manufacturer's recommendations.

B. Insert: The insert body shall be manufactured of 304 stainless steel with a thickness of not less than 18 gage. The insert shall have a straight side design to allow a loose fit into frame for easy removal. The insert manufacturer must furnish a "Load Test Verification" showing a load test failure in excess of 3,000 lbs.

C. Gasket: The gasket shall be made of closed cell neoprene and shall have a pressure sensitive adhesive on one side. The gasket shall be installed by the manufacturer and must be compatible with the insert material to form a long lasting bond in wet or dry conditions.

D. Relief Valve: The gas relief valve shall be designed to release at a pressure of 0.5 to 1.5 psi and have a water leak down rate no greater than 5 gallons per 24 hours. The valve shall be installed in the insert by means of a hole tapped in the insert by the manufacturer. The valve shall be made of Nitrile for prevention of corrosion from contact with hydrogen sulfide, dilute sulfuric acid and other gases associated with waste-water collection systems.

E. Handle: The dish shall have a handle of 3/16-inch plastic coated stainless steel cable installed on the body of the dish. The handle shall be attached with a #6 high grade stainless steel rivet. The cable shall be braided in a manner which resists cutting with common bolt cutters. The cable terminal and eye end shall be made of stainless steel.

F. Tether: Each dish shall have a factory installed five foot long, 1/8-inch stainless steel cable retaining tether attached to the bottom of the dish using a high grade stainless steel rivet. The cable shall be braided in a manner which resists cutting with common bolt cutters. The cable terminals and eye ends shall be made of stainless steel.

G. Insert shall be as manufactured by Southwestern Packing and Seals, Inc. of Shreveport, LA. (contact Roy Wolf, (800) 843-4950 or www.no-dig.com) or approved equal. No plastic inserts allowed.

2.03 GROUT

A. As specified in Section 03600.

PART 3 EXECUTION

3.01 INSTALLATION

A. Products shall be installed and work shall be completed as recommended by the manufacturer. Provide accessories, fasteners, and sealants as recommended by the manufacturer.

3.02 FIELD QUALITY CONTROL

A. Testing: Contractor shall provide all testing equipment. Equipment shall be in good condition and shall be calibrated as defined by applicable standards. Test equipment shall be available to the inspector at all times. Failure to maintain test equipment in proper working order or failure to have test equipment available to inspector when needed may require delaying the related work and shall not be considered a valid reason for time extensions or delay claims.

B. Testing reports: A test report shall be completed for every manhole. The test report shall be on a form provided by the Project Representative and shall be completed and signed by the Contractor. Forms shall be completed at the time of the testing or completion.

3.03 CLEANUP

A. Upon completion of work, the Contractor shall remove surplus materials, protective coverings and accumulated rubbish, and clean all surfaces and repair any damages.

3.04 PROTECTION

A. Comply with manufacturer's recommendations for allowing traffic to drive over manholes, unless directed otherwise by the Project Representative.

B. Prevent wet or dry overspray from leaving the immediate vicinity of the manhole. Provide all necessary protection to vehicles and private property.

C. Settable solids, rocks, concrete chips, chemicals, or debris incidental to work under this Contract shall be prevented from entering the sewer.

D. Where protection is provided for coated surfaces, such protection shall be preserved in place until the coating film has properly dried and the removal of the protection is authorized by the Project Representative. Items which have been coated shall not be handled, worked on or otherwise disturbed, until the coating is completely dry and hard.

3.05 MANHOLE PAN

A. Installation: The manhole frame rim shall be free of all dirt and debris prior to the installation of the manhole insert. The insert should be fully seated around the manhole frame rim to ensure against water seepage between the insert and manhole frame rim. Tether to be attached to ring or bolted to cone, as directed by the Project Representative.

NTS: Manhole pans cannot be installed in existing structures which have a locking cover.

3.06 GROUT

A. Prepare surfaces and apply grout as specified in Section 03600 and as recommended by the product manufacturer.

3.07 COATINGS

A. Prepare surfaces and apply coatings as specified in Section 09910 and as recommended by the product manufacturer.

END OF SECTION

SECTION 02652

CURE IN PLACE PIPE (CIPP)

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies rehabilitation of pipelines by the installation of a resin-impregnated fabric liner.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 02105: Sewer Bypassing.
   2. Section 02650: Pipeline Cleaning.
   3. Section 02653: Service Connection Rehabilitation Liner.
   4. Section 02761: Television Inspection of Existing and Rehabilitated Sewers.

C. Service connections may be rehabilitated with products specified in Section 02653. Contractor shall coordinate rehabilitation of mainlines and service connections with product installers. Contractor shall ensure that resin systems are compatible with all rehabilitation products that they will contact.

NTS: MODIFY SUBPARAGRAPHS B AND C AS APPROPRIATE BASED ON PROPOSED METHOD OF REINSTATING/REHABILITATING SERVICE CONNECTIONS.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents. They are part of this section insofar as specified and modified herein. In case of conflict between the requirements of this Section and the listed documents, the requirements of this Section shall prevail.

Reference	Title
ASTM D543	Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D903	Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
ASTM D1600	Standard Terminology for Abbreviated Terms Relating to Plastics
ASTM D2990	Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics
ASTM D3839	Standard Practice for Underground Installation of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
ASTM F412	Standard Terminology Relating to Plastic Piping Systems
ASTM F1216	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
ASTM F1743	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)
ASTM F2019	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)

1.03 DEFINITIONS

A. Definitions are in accordance with terminology of ASTM F412, unless otherwise specified. Abbreviations are in accordance with terminology of ASTM D1600, unless otherwise specified.

1. Service connection is the point where the lateral pipe intersects with the mainline pipe, also known as the lateral interface. It can be the interface portion of a tee, wye, or cut-in connection where the lateral pipe flows into the main.
2. Host Pipe: An existing pipeline or conduit to be internally rehabilitated by installation of a pipe liner.
3. Manufacturer and/or Assembler: The entity responsible for obtaining individual components of a system and assembling into the final products which are shipped to the job site for installation.
4. Installer: Licensed contractor or subcontractor responsible for the installation of the system in the field.
5. Field Superintendent: Specific person responsible for field supervision of the installation of the system.
6. Lateral and side sewers are the same as building sanitary sewer as defined in ASTM F412.

1.04 QUALIFICATIONS

A. Product, Manufacturer/Assembler, Installer, and Field Superintendent Qualification Requirements:
   1. The Manufacturer or Assembler shall have supplied the product bid for a minimum of 50,000 linear feet of installations. Contractor shall provide a list of installation projects. Also, provide the project names, owner contacts, phone numbers, and year installed.
   2. The Field Superintendent shall have been the superintendent on a minimum of 20,000 linear feet of installations with the product bid. Contractor shall provide a list of installation projects. Also, provide the project names, owner contacts, phone numbers, and year installed. The named Field Superintendent shall remain on the project through completion.
   3. The Contractor shall have a minimum of 5 years recent experience in sewer main rehabilitation, including familiarity with CIPP processes. Contractor shall submit list of a minimum of 5 references including contact names, phone numbers, and year installed for sewer rehabilitation projects.
   4. The Lateral Cutter Operator shall have a minimum of 6 months experience. Contractor shall submit experience of all personnel to be used as Lateral Cutter Operators.
   5. Certification showing that the Installer is currently licensed by the appropriate licensor to perform CIPP installation.

1.05 SUBMITTALS

A. Submit the following in accordance with Section 01300:
   1. Data sheets for each section of CIPP liner to be installed that includes liner length, depth of installation, and liner thickness.
   2. Certification showing that the Installer is currently licensed by the appropriate licensor to perform CIPP installation. Certification shall be given to the Project Representative prior to delivery of material to the job site.
   3. Details on all lining materials and resins.
   4. Name of resin supplier and liner fabric supplier.
   5. Technical data showing that the cured CIPP system meets the chemical resistance and corrosion resistance requirements of this specification section.
   6. Manufacturer's or Assembler's certification that the liner materials and system are in compliance with the specifications, codes, and standards referenced herein.
   7. Manufacturer's or Assembler's recommendations for factory and field (whichever applies) wet out procedures including: volume of resin per unit of liner, roller gap setting, mixing ratios and procedures for resin and catalyst/hardener, shelf life of resin, pot life of resin, required wet out procedure to ensure full saturation, and other criteria deemed necessary to ensure proper wet out of the liner.
   8. Manufacturer's or Assembler's data sheets for each segment of factory wet out and/or Contractor's data sheets for each segment of field wet out liner showing: quantity of resin and catalyst used for each length of liner, roller gap setting used, identification number of liner segment, and other criteria deemed necessary to ensure proper wet out of the liner.

NTS: ITEMS 7 AND 8 ABOVE MAY BE DIFFICULT TO ATTAIN BECAUSE THE INFORMATION MAY BE CONSIDERED PROPRIETARY.

9. Manufacturer's or Assembler's certification that all Manufacturer's or Assembler's wet out recommendations have been followed on all lengths of CIPP which have factory wet out.
10. Manufacturer's or Assembler's recommendations for storage procedures and temperature control, handling and inserting the liner, curing details and minimum equipment requirements to allow for an adequate installation.
11. Manufacturer's or Assembler's recommendations for minimum and maximum pressures, temperatures, and time durations to be used during liner inversion, cure, and cool down.
12. Data on Contractor's equipment to be used on site including: type and tolerance of temperature gages and thermocouples used to monitor cure temperature; type and tolerance of equipment used to generate liner inversion pressure; make model, and technical data of all equipment used to generate heat for the curing process; make, model and technical data of backup equipment used to maintain curing temperature; approximate size of vehicle(s) which carries the CIPP pipe and installation equipment.
13. The Manufacturer's or Assembler's heating requirements and curing guidelines.
14. Procedures for cool down and relieving static head after CIPP cure.
15. CIPP samples in accordance with Paragraph 3.04A of this section.
16. Data-logger output in printed and electronic (excel spreadsheet) formats.
17. Material Safety Data Sheets for resins, hardeners, solvents, and all other compounds or chemicals to be used on job site.

1.06 QUALITY ASSURANCE

A. The Manufacturer or Assembler shall send a representative familiar with CIPP processes to the site to observe the initial five (5) installations of each product installed by the Contractor.
   1. The Manufacturer or Assembler's representative shall provide certification to the Project Representative stating that the Contractor's installation methods meet the Manufacturer or Assembler's requirements.
   2. After the initial installations, the product Manufacturer or Assembler's representative shall meet with the Project Representative to discuss inspection items that the Project Representative should observe and record for subsequent installations. Inspection items include pre-installation activities, product identification, installation procedures, equipment operations, and post-installation activities.

NTS: THE MANUFACTURER AND THE INSTALLER OF CIPP LINERS FOR MAINS ARE OFTEN ONE ENTITY. IF THEY ARE DIFFERENT COMPANIES, THE NEED FOR MANUFACTURER REPRESENTATION SHOULD BE EVALUATED BY THE PROJECT REPRESENTATIVE BASED ON THE EXPERIENCE AND QUALITY OF WORK OF THE INSTALLER.

B. The finished CIPP shall be continuous over the entire length of an insertion run between two manholes or access points and shall be free from visual defects such as foreign inclusions, dry spots, pinholes, and delamination.

C. Wrinkles in the finished CIPP greater than 5 percent of the pipe diameter are unacceptable and shall be removed and repaired by the Contractor at the Contractor's expense. Methods of repair shall be proposed by Contractor and submitted to the Project Representative for review. No wrinkles in the CIPP are allowed within 4 feet of liner terminations at manholes.

1.07 LICENSING AND CERTIFICATION

A. The Contractor or subcontractor installing the CIPP shall have a current license agreement with the product Manufacturer or Assembler.

B. Individuals installing the CIPP shall be certified by the product Manufacturer or Assembler.

C. Lining installation shall be in accordance with the requirements of the product Manufacturer or Assembler and as directed by their Technical Representative. This includes the correction of defective work.

1.08 WARRANTY

A. The Contractor shall warrant each mainline, lateral, and side sewer lined with the specified product against defects in materials, surface preparation, lining application, and workmanship for a period of 18 months from the date of final acceptance of the project. The Contractor shall, within one month of written notice thereof, repair defects in materials or workmanship that may develop during said 18-month period. Defects shall be defined as: evidence of visible leakage of groundwater through the CIPP system, delamination of any portion of the CIPP system as visible from CCTV inspection, or separation of any part of the CIPP system from the host pipe to the extent that the CIPP system inside diameter in the separated area is 95 percent or less of the completed CIPP system inside diameter. The Contractor shall also repair any damage to other work; damage to sewer system components, damage to buildings, houses or environmental damage caused by the backup of the sewer because of the failure of the lining system; or repairing of the same.

B. Repairs shall include removal of the existing liner and re-lining if possible, or excavation and replacement of the section of pipe where the defect occurs.

PART 2 MATERIALS

2.01 CURE IN PLACE PIPE LINER

A. The CIPP shall consist of one or more layers of flexible needled felt or an equivalent non-woven material, or a combination of non-woven and woven materials capable of carrying resin, withstanding installation pressures.
   1. The CIPP shall be continuous in length and the wall thickness shall be uniform. No overlapping sections shall be allowed in the length of the liner. No overlapping sections shall be allowed in the circumference of the liner when felt liner is used.
   2. The CIPP will be capable of conforming to offset joints, bells, and disfigured pipe sections. It shall be able to stretch to fit irregular pipe sections and negotiate bends.
   3. The CIPP resin shall be compatible with the liner fabric, other rehabilitation systems it may contact, and the host pipe materials.
   4. Seams in the CIPP shall be stronger than the non-seamed felt.
   5. The CIPP shall be marked at regular intervals along its entire length, not to exceed 5 feet. Markings shall include Manufacturer's or Assembler's name or identifying symbol.
   6. The CIPP liner shall be manufactured with materials from a consistent supplier. All materials of similar type shall be from a single source for the entire project.

B. The CIPP shall be fabricated to a size that, when installed, will tightly fit the internal circumference and length of the original pipe.
   1. Allowance shall be made for circumferential stretching during the installation process.
   2. The hydraulic capacity of the CIPP shall be greater than or equal to the hydraulic capacity of the original host pipe, based on hydraulic calculations with standard engineering roughness coefficients.

C. The liner thickness shall be designed based on the engineering formulas listed in ASTM F1216 for ***fully deteriorated*** pipes, assuming groundwater at the surface, HS-20 live loading, 120 pounds per cubic foot dry soil density, and depth of cover as determined by the adjacent upstream or downstream manhole, whichever is deeper. The thickness shall be sufficient to prevent groundwater from entering the pipe, while maintaining the maximum cross-sectional pipe area possible.

NTS: REQUIRE DESIGN BASED ON FULLY DETERIORATED PIPE OR PARTIALLY DETERIORATED PIPE PER ASTM F1216 BASED ON THE CONDITION OF THE HOST PIPE.

D. For liners inserted by the inversion method, the CIPP shall be coated on one side with a translucent waterproof coating of:
   1. Polyvinyl chloride (PVC)
   2. Polyurethane
   3. Polyethylene

E. For liners inserted by the pull/winch method, the CIPP shall be coated on one side with a translucent waterproof coating of:
   1. Polyvinyl chloride (PVC)
   2. Polyurethane
   3. Polyethylene
   4. Polypropylene
   5. Or approved equal.

F. Subject to these specifications, the following manufacturers or assemblers are acceptable:
   1. Gelco Services Inc. (Salem, OR)
   2. Pacific Multilining Inc. (Abbotsford, BC, Canada)
   3. C.I.P.P. Corporation (Hudson, IA)
   4. Perma-Liner Industries, Inc. (Clearwater, FL)
   5. LMK Enterprises Inc. (Ottawa, IL)
   6. Insituform Technologies, Inc. (Chesterfield, MO)
   7. Inliner Technologies (Paoli, IN)
   8. Or approved equal.

NTS: REVISE LIST OF ACCEPTABLE MANUFACTURERS AS APPROPRIATE.

2.02 RESIN

A. A general purpose, unsaturated thermosetting, polyester, vinylester, or epoxy resin compatible with the fabric liner material, host pipe material, and other rehabilitation products that the resin may contact.

B. Resin shall meet or exceed the physical properties listed in Section 2.03.

C. Resin shall form no excessive bubbling or wrinkling during lining.

D. Resin shall be manufactured with materials from a consistent supplier. All materials of similar type shall be from a single source for the entire project.

E. The resin shall have no fillers added for the sole purpose of increasing the resin volume.

2.03 PHYSICAL PROPERTIES

A. The composite materials of the fabric liner tube and resin shall, upon installation inside the host pipe, exceed the minimum test standards specified by the American Society for Testing and Materials based upon restrained sample cured in host pipe and flat plate sample:

Physical Properties	
Flexural Strength (ASTM D790)	4,500 psi
Flexural Modulus (ASTM D790)	300,000 psi
Flexural Modulus (ASTM D2990) Long Term	150,000 psi

B. The CIPP after installation shall be corrosion resistant to withstand exposure to sewage gases containing quantities of hydrogen sulfide, carbon monoxide, diluted sulfuric acid, and other chemical reagents typical of sewage conveyance. Chemical resistance of the installed CIPP shall meet the chemical resistance requirements of ASTM F1216.

C. The wall color of the interior pipe surface of the CIPP after installation shall be a light reflective color.

D. The hydraulic profile of the installed CIPP shall be maintained as large as possible. The CIPP shall have at a minimum the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using commonly accepted roughness coefficients for the existing pipe material taking into consideration its age and condition.

2.04 PRESSURE GROUT

A. Chemical grout designed for injection. ***AV-100 chemical grout as manufactured by Avanti International, or approved equal.***

PART 3 EXECUTION

3.01 PREPARATION

A. Make all necessary provisions to ensure service conditions and structural conditions of host pipe are suitable for installation and warranty of the liner. Provisions shall include, but are not limited to temporary sewer bypassing, temporary service interruption of side sewers tributary to the sewer main, temporary shutdown of water service, utility coordination for interruption of water service, correction of structural defects, and adjustment of active infiltration.

B. Bypass Pumping
   1. Provide bypass pumping and diversion in accordance with Section 02105. No flow that will negatively affect the liner shall be allowed in pipe during CIPP installation.

C. Temporary Interruption of Service
   1. Provide notification to residences of services that will be temporarily out of service, in accordance with Section 02105.
   2. Schedule service interruptions per Section 01014.
   3. Coordinate all service interruptions with the Project Representative.

D. Cleaning
   1. Clean and prepare pipe per Section 02650.
   2. Where a conflict exists between Section 02650 and the CIPP Manufacturer's or Assembler's requirements, the Manufacturer's or Assembler's requirements shall prevail.

NTS: EFFORT BEYOND NORMAL TWO-PASS CLEANING OF THE MAIN PRIOR TO LINING, SUCH AS SIGNIFICANT ROOT CUTTING IN THE MAINS AND LATERALS, SHOULD BE NOTED IN THE SPECIFICATIONS. CONSIDER ADDING UNIT COST BID ITEMS SO THAT APPROPRIATE PAYMENT CAN BE MADE FOR ADDITIONAL EFFORT.

E. Point Repairs
   1. Repair defects in the pipeline including, but not limited to open joints, fractures, cracks, and holes in the pipeline as follows:
      a. As recommended by Manufacturer or Installer.
   2. Remove protruding laterals, rolled gaskets, roots, mineral deposits, and other objects protruding into the pipe, internally with a remote controlled cutter. ***Approximately 10 percent of the total number of laterals on this project are protruding and will require trimming.***

NTS: PRIOR TO BIDDING, AN ASSESSMENT NEEDS TO BE MADE REGARDING THE EXTENT OF POINT REPAIRS THAT WILL BE REQUIRED. IF SIGNIFICANT AMOUNTS ARE ANTICIPATED, PROVIDE GUIDANCE SUCH AS THE 10 PERCENT OF PROTRUDING LATERALS NOTED ABOVE AS A BASIS FOR BID FOR THE CONTRACTOR.

F. Pre-CCTV Inspection
   1. Perform a closed circuit television (CCTV) inspection of the pipeline prior to liner installation in accordance with Section 02761.

G. Initial Installations
   1. The first five CIPP installations, from manhole to manhole, shall be made under the supervision of the product Manufacturer's or Assembler's representative. The locations of the installations shall be representative of typical site conditions.
   2. Initial installations shall be by the same crews and equipment to be used for the remaining installations.

3. ***The Manufacturer's or Assembler's representative shall provide written and signed certification to the Project Representative ensuring that the Contractor's installations meet all requirements of the Manufacturer or Assembler and will not void the Owner's warranty.***

NTS: THE MANUFACTURER AND THE INSTALLER OF CIPP LINERS FOR MAINS ARE OFTEN ONE ENTITY. IF THEY ARE DIFFERENT COMPANIES, THE NEED FOR MANUFACTURER REPRESENTATION SHOULD BE EVALUATED BY THE PROJECT REPRESENTATIVE BASED ON THE EXPERIENCE AND QUALITY OF WORK OF THE INSTALLER.

H. Manholes
1. Protect all manholes to withstand forces generated by the equipment while installing the liner.

3.02 INSTALLATION

A. Resin Impregnation
1. Vacuum impregnate the liner fabric with resin under controlled conditions.
2. Use a volume of resin sufficient to fill all voids in the tube material at nominal thickness and diameter. Volume should be adjusted by adding excess resin for the change in resin volume due to polymerization and to allow for any migration of resin into the cracks and joints of the host pipe, per Manufacturer's or Assembler's recommendations.
3. The resin impregnated tube shall be stored in such a manner that it will not be damaged, exposed to direct sunlight, exposed to any curing environment, or result in a public safety hazard. All materials shall be subject to inspection and review prior to installation.

B. Liner Installation
1. Inversion Method
   a. The impregnated tube shall be inserted through an existing manhole or other access point by means of the Manufacturer's or Assembler's recommended installation process and in accordance with ASTM F1216. The application of a hydrostatic head, compressed air, or other means shall fully extend the liner to the next designated manhole or termination point and inflate and firmly adhere the liner to the pipe wall.
   b. The rate of the liner installation shall not exceed the maximum rate recommended by the manufacturer.

2. When inversion is by hydrostatic head, the Contractor shall use methods which control the installation rate, accounting for the increase in hydrostatic head in pipes which have significant elevation change.
3. Pull/Winch Method
   a. The impregnated tube shall be pulled into place in accordance with ASTM F1473 or ASTM F2019 within the host pipe with the aid of a power winch that for felt tubes is equipped with a device to monitor the force and prevent excessive tension and tube elongation.
   b. The maximum allowable longitudinal elongation, or stretch, of the material shall be one (1) percent. The longitudinal stretch of the tube shall be gauged by comparing marker on the fully inserted tube to the actual length of pipe being rehabilitated.
   c. The Contractor shall use a flexible and impermeable calibration hose to inflate the tube. The calibration hose may or may not remain in the complete installation. Any dry tube or inflation hose material that enters the existing pipe that has not been previously vacuum impregnated with resin cannot be included in the structural wall of the CIPP. Hose materials remaining in the installation shall be compatible with the resin system used, shall bond permanently with the tube, and shall be translucent to facilitate post-installation inspection. Hose materials that are to be removed after curing shall be of non-bondable material.
4. The impact of slope and grade change shall be accounted for in the design and installation of liners on steep slopes.

C. Curing
1. For Water, Air, or Steam Cure:
   a. After placement of the liner is complete, provide a suitable heat source and distribution equipment. The equipment shall be capable of circulating hot water, air, and/or steam throughout the lined section in accordance with the Manufacturer's or Assembler's

recommendations to raise the temperature uniformly above the temperature required to affect a resin cure. This temperature shall be determined by the Manufacturer or Assembler based on the resin/hardener system employed.

b. The heat source shall be fitted with continuous monitoring thermocouples to measure and record the temperature of the incoming and outgoing water, steam, and/or air supply. Water, steam, or air temperature during the cure period shall meet the requirements of the resin Manufacturer or Assembler as measured and recorded at the heat source inflow and outflow return lines.

c. Provide standby equipment to maintain the heat source supply. The temperature during the cure shall not be less than 130 degrees Fahrenheit at the boundary between the pipe wall and the liner unless otherwise directed by the Manufacturer or Assembler to meet resin system requirements.

d. Temperature shall be maintained during the curing period as recommended by the resin Manufacturer or Assembler, and shall follow the healing schedule supplied by the Manufacturer or Assembler.

D. Cool Down
   1. Cool the liner down to temperature specified by Manufacturer or Assembler following the cure period, for duration specified by Manufacturer or Assembler, prior to relieving static head.
   2. Care shall be taken to ensure that a vacuum is not induced which could damage the new CIPP during the release of head on the new CIPP.

E. Sealing at the Sewer Main and Manholes
   1. Make a watertight seal between the CIPP and the host pipe at the manholes. No water shall be able to migrate between the CIPP and the host pipe, otherwise the CIPP shall be considered defective and shall be repaired or replaced at the Contractor's expense.
   2. If a CIPP is installed through an intermediate manhole it shall remain continuous. After curing, the liner within the manhole shall be cut and removed above the top of the existing channel.

F. CIPP Liner Termination in Manholes
   1. Per details in the Drawings.

NTS: LINER TERMINATION DETAIL REQUIRED ON DRAWINGS.

G. A data logger shall continuously record temperature, pressure and time during heating, cure and cool down at the liner insertion, termination and intermediate manholes. Temperature and pressure versus time shall be plotted on a line graph and provided to the Project Representative for each lining segment.

3.03 SERVICE CONNECTION RESTORATION

A. Restore service connections (also known as reinstating service connections) to the lined pipe by one of the following methods:
   1. Internally reconnected by using a pivot-headed CCTV camera and a remote cutting tool to locate the service connections from inside the lined pipe, cutting a hole matching the service connection diameter, and grouting the area where the service connection enters the lined pipe to produce a water tight seal (except that grouting needl not be performed where service connection rehabilitation liners are installed). Provide a nearly full-diameter hole, free from burrs or projections and with a smooth and crack-free edge. The hole shall be 95 percent minimum and 100 percent maximum of the original service connection inside diameter. The invert of the service connection shall match the bottom of the reinstated service opening. The CCTV during cutting shall be recorded on VHS tape and shall include a pan and tilt view of entire lateral circumference following cutting.
   2. Other remote methods as approved by the Project Representative.

3.04 TESTING

A. Material Testing
   1. Provide flat plate samples of the cured lining material fabricated from the tube and resin/hardener system used and cured in a clamped mold placed in the downtube when circulating heated water is used and in the silencer when steam is used. The sample will be large enough to allow for a minimum of five specimens for flexural testing per ASTM D790 by the Project Representative.
   2. For CIPP systems where wetout of the fabric is performed in the field, provide a set of three samples per each 3,000 linear feet of liner installed or one set of three samples for the entire project, whichever number is greater, consisting of the following samples taken when directed by the Project Representative.
      a. Sample of resin in its liquid, uncured form in a minimum 100 milliliter and maximum 1 gallon sealable container made of like materials as the supply container and containing a minimum of 50 milliliters of sample.
      b. Sample of catalyst in its liquid, uncured form in similar container and sample size as Paragraph 3.04A.2.a.
      c. Sample of combined resin and catalyst following mixing, in its liquid, uncured form in similar container and sample size as Paragraph 3.04A.2.a.

NTS: THE NEED FOR MATERIAL TESTING SHOULD BE EVALUATED BY THE PROJECT REPRESENTATIVE BASED ON THE EXPERIENCE AND QUALITY OF WORK OF THE INSTALLER. TESTING OF THE FIELD SAMPLES BY THE OWNER IS VERY EXPENSIVE TO PERFORM.

B. Field Testing
   1. Low Pressure Air Test: The entire rehabilitated main shall be low pressure air tested prior to reinstatement of service connections as follows:
      a. The test equipment to be used shall be approved by the Project Representative prior to use. The Project Representative may at any time require a calibration test of gauges or other instrumentation that is incorporated into the test equipment. Calibration tests shall be certified by an independent testing laboratory.
      b. Plugs used to close the pipe for the air test must be securely braced to prevent the unintentional release of a plug which can become a high velocity projectile. Gauges, air piping manifold, and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole or pit where a plugged pipe is under pressure. Air testing apparatus shall be equipped with a pressure release device, such as a rupture disk or a pressure relief valve, designed to activate when the pressure in the pipe exceeds 2 psig above the required test pressure.
      c. If the pipe to be tested is submerged by groundwater, the back pressure on the pipe created by the groundwater submergence must be determined. All gauge pressures described in the test shall be increased by that amount.
      d. The first section of pipe installed by each crew shall be tested in order to qualify the crew and material. A successful test for the section shall be a prerequisite to further installation by that crew.
      e. Air shall be slowly supplied to the lined pipe section until the internal air pressure reaches 4 psig. Wait at least two minutes to allow for pressure and temperature stabilization to occur within the pipe.
      f. When the pressure decreases to 3.5 psig, the air pressure test shall begin. The test shall consist of measuring the time in seconds for the pressure in the pipe to drop from 3.5 psig to 2.5 psig. The pipe shall be considered acceptable if the time for the pressure drop is equal to or greater than 10 minutes.
      g. The Contractor shall be required at no expense to King County, Utility Owner, or Facility Owner, to locate, uncover, and repair any sections failing to pass the test. The Contractor shall retest the section after replacement of the pipe.
   2. Visual inspection of the CIPP shall be in accordance with ASTM F1743, Section 8.6.
   3. After completion of all CIPP insertions, service reconnections, and finish work at the manholes, the sewer shall be video recorded per Section 02761. The original recording shall be provided to the Project Representative.

a. Repair CIPP per the Manufacturer's or Assembler's recommendations if defects, including infiltration of groundwater is observed.
b. All service connections shall be accounted for and be unobstructed.

END OF SECTION

SECTION 02653

SERVICE CONNECTION REHABILITATION LINER

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies rehabilitation of mainline to lateral interfaces without excavation. The repair shall consist of a one-piece cured in place liner, which provides a verifiable non-leaking connection at the interface of the mainline and lateral pipelines.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 02105: Sewer Bypassing and Dewatering.
   2. Section 02650: Pipeline Cleaning.
   3. Section 02652: Cure in Place Pipe (CIPP).
   4. Section 02761: Television Inspection of Existing and Rehabilitated Sewers.

C. Portions of mainline and manholes may be rehabilitated with products specified in Section 02652. Contractor shall coordinate rehabilitation of mainlines and service connections with product installers. Contractor shall ensure that resin systems are compatible with all products that they will contact.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents. They are part of this section insofar as specified and modified herein. In case of conflict between the requirements of this Section and the listed documents, the requirements of this Section shall prevail.

Reference	Title
ASTM D543	Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D903	Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
ASTM D1600	Standard Terminology for Abbreviated Terms Relating to Plastics
ASTM D2990	Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics
ASTM D3839	Standard Practice for Underground Installation of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
ASTM F412	Standard Terminology Relating to Plastic Piping Systems
ASTM F1216	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
ASTM F1743	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)

1.03 DEFINITIONS

A. Definitions are in accordance with terminology of ASTM F412, unless otherwise specified.
   1. Service Connection: is the point where the lateral pipe intersects with the main line pipe, also know as the lateral interface. It can be the interface portion of a tee, wye or cut in connection where the lateral pipe flows into the main.
   2. Host Pipe: An existing pipeline or conduit to be internally rehabilitated by installation of a pipeliner.

3. Manufacturer and/or Assembler: The entity responsible for obtaining individual components of a system and assembling into the final products which are shipped to the job site for installation.
4. Installer: Licensed contractor or subcontractor responsible for the installation of the system in the field.
5. Field Superintendent: Specific person responsible for the field supervision of the installation of the system.
6. Laterals and side sewers are the same as a Building Sanitary Sewer as defined in ASTM F412.

B. Abbreviations are in accordance with terminology of ASTM D1600, unless otherwise specified.
1. SCRL: Service Connection Rehabilitation Liner

1.04 QUALIFICATIONS

A. Manufacturer or Assembler, Installer, Field Superintendent, and Contractor Qualification Requirements:
1. The Manufacturer or Assembler shall have a minimum of 200 installations of one-piece cured in place liners in North America. Contractor to provide list of installation projects. Provide the project names, owner contacts, phone numbers, and year installed.
2. The Installer shall have a minimum of 200 installations of one-piece cured in place liners in North America. Contractor to provide list of installation projects. Provide the project names, owner contacts, phone numbers, and year installed.
3. The Field Superintendent shall have a minimum of 200 installations of one-piece cured in place liners in North America. Contractor to provide Field Superintendent's name and list of installation projects. Provide the project names, owner contacts, phone numbers, and year installed. The named Field Superintendent shall remain on the project through completion.
4. The Contractor shall have a minimum of 5 years recent experience in sewer main rehabilitation, including familiarity with CIPP processes. Contractor shall submit list of a minimum of 5 references including contact names, phone numbers, and year installed for sewer rehabilitation projects.
5. The Lateral Cutter Operator shall have a minimum of 6 months experience. Contractor shall submit experience of all personnel to be used as Lateral Cutter Operators.
6. Certification showing that the Installer is currently licensed by the appropriate licensor to perform SCRL installation.

1.05 SUBMITTALS

A. Submit the following in accordance with Section 01300:
1. Certification showing that the Installer is currently licensed by the appropriate licensor to perform SCRL installation. Certification shall be given to the Project Representative prior to delivery of material to the job site.
2. Details on all lining materials and resins.
3. Name of resin supplier and liner fabric supplier.
4. Technical data showing that the cured SCRL system meets the chemical resistance and corrosion resistance requirements of this specification section.
5. Manufacturer's or Assembler's certification that the SCRL materials and system are in compliance with the specifications, codes, and standards referenced herein.
6. Manufacturer's or Assembler's recommendations for factory and field (whichever applies) wet out procedures including: volume of resin per unit of liner, mixing ratios and procedures for resin and catalyst/hardener, shelf life of resin, pot life of resin, required wet out procedure to ensure full saturation, and other criteria deemed necessary to ensure proper wet out of the liner.
7. Manufacturer's or Assembler's data sheets for factory wet out and/or Contractor's data sheets for field wet out showing: quantity of resin and catalyst used, identification number, and other criteria deemed necessary to ensure proper wet out of the liner for each length of liner.
8. Manufacturer's or Assembler's certification that all Manufacturer's or Assembler's wet out recommendations have been followed on all lengths of SCRL which have factory wet out.
9. Manufacturer's or Assembler's recommendations for storage procedures and temperature control, handling and inserting the liner, curing details, and minimum equipment requirements to allow for an adequate installation.

10. Manufacturer's or Assembler's recommendations for minimum and maximum pressures, temperatures, and time durations to be used during SCRL placement, cure, and cool down.
11. The Manufacturer's or Assembler's heating requirements and curing guidelines.
12. Procedures for cool down and relieving static head after SCRL cure.
13. SCRL samples in accordance with Paragraph 3.03A of this section.
16. Material Safety Data Sheets for resins, hardeners, solvents, and all other compounds or chemicals to be used on jobsite.

1.06 QUALITY ASSURANCE

A. The Manufacturer or Assembler shall send a representative familiar with SCRL processes to the site to observe at least the initial five installations of the SCRL installed by the Contractor.
   1. The Manufacturer's or Assembler's representative shall provide certification to the Project Representative ensuring that the Contractor's installation methods meet the Manufacturer's or Assembler's requirements.
   2. After the initial installations, the product Manufacturer's or Assembler's representative shall meet with the Project Representative to discuss inspection items that the Project Representative should observe and record for subsequent installations. Inspection items include pre-installation activities, product identification, installation procedures, equipment operations, and post-installation activities.

NTS: NEED TO EVALUATE THE DIFFICULTY AND COST TO HAVE MANUFACTURER'S REPRESENTATIVE OBSERVING INITIAL FIELD INSTALLATIONS. THIS CAN BE A HARD REQUIREMENT TO ENFORCE BECAUSE OF SCHEDULING CONSTRAINTS.

B. The finished SCRL shall be free from visual defects such as foreign inclusions, dry spots, pinholes, and delamination.

C. Wrinkles in the finished SCRL 5 percent or greater of the pipe diameter are unacceptable and shall be removed and repaired by the Contractor. Methods of repair shall be proposed by Contractor and submitted to the Project Representative for review.

1.07 LICENSING AND CERTIFICATION

A. The Contractor or subcontractor installing the SCRL shall have a current license agreement with the product Manufacturer or Assembler.

B. Individuals installing the SCRL shall be certified by the product Manufacturer or Assembler.

C. Lining installation shall be in accordance with the requirements of the product Manufacturer or Assembler and as directed by their Technical Representative. This includes the correction of defective work.

1.08 WARRANTY

A. The Contractor shall warrant each service connection and that portion of the mainline and or lateral lined with the specified product against defects in materials, surface preparation, lining application and workmanship for a period of 18 months from the date of final acceptance of the project. The Contractor shall, within one month of written notice thereof, repair defects in materials or workmanship that may develop during said 18-month period. Defects shall be defined as: evidence of visible leakage of groundwater through the SCRL system, visible leakage of groundwater between the SCRL and the sewer main CIPP lining, delamination of any portion of the SCRL system as visible from CCTV inspection, or separation of any part of the SCRL system from the host pipe to the extent that the SCRL system inside diameter in the separated area is 95 percent or less of the completed SCRL system inside diameter. The Contractor shall also repair any damage to other work; damage to sewer system components damage to buildings, houses or environmental damage caused by the backup of the sewer because of the failure of the lining system; or repairing of the same.

B. Repairs shall include removal of the existing liner and re-lining if possible, or excavation and replacement of the section of pipe where the defect occurs, including replacement of sections of mainline or lateral pipes as needed to effectively repair the connections.

PART 2 MATERIALS

2.01 CURE IN PLACE SERVICE CONNECTION REHABILITATION LINER

A. The SCRL shall consist of one or more layers of flexible needled felt or an equivalent non-woven material, or a combination of non-woven and woven materials capable of carrying resin, withstanding installation pressures.
   1. The SCRL will have a minimum of 3-inch wide contact area on the wall of the main line pipe around the connection of the lateral (the brim) and the thickness shall be uniform.
   2. There shall be a minimum of 6-inches of contact area extending from the “brim” into the lateral.
   3. The SCRL will be capable of conforming to the connection and into the lateral. It shall be able to stretch to fit an irregular pipe service connection.
   4. The resin shall be compatible with the liner fabric, other rehabilitation lining systems that it may contact, and the host pipe materials.
   5. Seams shall be stronger than the non-seamed liner fabric.
   6. The SCRL shall be manufactured with material from a consistent supplier. All materials of similar type shall be from a single source for the entire project.

B. The SCRL shall be fabricated to a size that, when installed, will tightly fit the internal circumferences of the original pipe.
   1. Allowance shall be made for circumferential stretching during the installation process.
   2. The hydraulic capacity of the SCRL shall be greater than or equal to the hydraulic capacity of the original host pipe, based on hydraulic calculations with standard engineering roughness coefficients.

C. The SCRL shall be designed to be installed from the mainline with no lateral access required.

D. Subject to these specifications, the following products and Manufacturer or Assemblers are acceptable:
   1. “Top Hat” Lateral Sealing Systems, manufactured by Cosmic Sondermaschinenbau.
   2. InnerSeal Connection System, manufactured by Perma-Liner Industries, Inc.
   3. Insituform Connection System, manufactured by Insituform Technologies, Inc.
   4. Or approved equal.

NTS: REVISE LIST OF ACCEPTABLE MANUFACTURERS AS APPROPRIATE.

2.02 RESIN

A. A general purpose, unsaturated thermosetting or UV-setting, polyester, vinylester, or epoxy resin compatible with the fabric liner material, host pipe material, and other rehabilitation systems that it may contact, and with proper catalysts and/or hardeners as designed for the specific application.

B. Resin shall meet or exceed the physical properties listed in Section 2.03.

C. Resin shall form no excessive bubbling or wrinkling during lining.

D. Resin shall be manufactured with materials from a consistent supplier. All materials of similar type shall be from a single source for the entire project.

E. The resin shall have no fillers added for the sole purpose of increasing the resin volume.

2.03 PHYSICAL PROPERTIES

A. The composite materials of the liner fabric and resin shall, upon installation inside the host pipe, exceed the minimum test standards specified by the American Society for Testing and Materials:

Physical Properties	
Flexural Strength (ASTM D790)	4,500 psi
Flexural Modulus (ASTM D790)	250,000 psi

B. The SCRL shall be corrosion resistant to withstand exposure to sewage gases containing quantities of hydrogen sulfide, carbon monoxide, diluted sulfuric acid, and other chemical reagents typical of sewage conveyance. Chemical resistance of the installed SCRL shall meet the chemical resistance requirements of ASTM F1216.

C. The wall color of the interior pipe surface of the SCRL after installation shall be a light reflective color.

D. The hydraulic profile of the installed SCRL shall be maintained as large as possible. The SCRL shall have at a minimum the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using commonly accepted roughness coefficients for the existing pipe material taking into consideration its age and condition.

2.04 PRESSURE GROUT

A. Chemical grout designed for injection. ***AV-100 chemical grout as manufactured by Avanti International, or approved equal.***

PART 3 EXECUTION

3.01 PREPARATION

A. Make all necessary provisions to ensure service conditions and structural conditions of host pipe are suitable for installation and warranty of the service connection rehabilitation liner. Provisions shall include, but are not limited to temporary sewer bypassing, temporary service interruption of side sewer, temporary shutdown of water service, utility coordination for interruption of water service, correction of structural defects, and adjustment of active infiltration.

B. Bypass Pumping
   1. Provide bypass pumping and diversion per Section 02105. No flow that will negatively affect the installation of the SCRL shall be allowed in pipe during SCRL installation.

C. Temporary Interruption of Service
   1. Provide notification to residences of services that will be temporarily out of service, per Section 02105.
   2. Schedule service interruptions per Section 01014.
   3. Coordinate all service interruptions with the Project Representative.

D. Cleaning
   1. Clean and prepare sewer main and lateral per Section 02650.
   2. Cleaning and preparation shall reach at least 2 feet into the lateral from the main pipe.
   3. Where a conflict exists between Section 02650 and the SCRL Manufacturer's or Assembler's requirements, the Manufacturer's or Assembler's requirements shall prevail.
   4. Approximately 25 percent of the laterals will require removal of roots or other obstructions that cannot be removed by pressure washing.

NTS: PRIOR TO BIDDING, AN ASSESSMENT NEEDS TO BE MADE REGARDING THE EXTENT OF ROOT CLEANING THAT WILL BE REQUIRED TO INSTALL THE SCRL'S. IF SIGNIFICANT

AMOUNTS ARE ANTICIPATED, PROVIDE GUIDANCE SUCH AS THE 25 PERCENT OF LATERALS NOTED ABOVE AS A BASIS FOR BID FOR THE CONTRACTOR.

E. Point Repairs
   1. Repair defects in the pipeline including, but not limited to open joints, fractures, cracks, and holes in the pipeline as follows:
      a. As recommended by Manufacturer or Installer.
   2. Remove protruding laterals, rolled gaskets, roots, mineral deposits, and other objects protruding into the pipe internally with a remote controlled cutter. ***Approximately 10 percent of the total number of laterals on this project are protruding and will require trimming.***

NTS: PRIOR TO BIDDING, AN ASSESSMENT NEEDS TO BE MADE REGARDING THE EXTENT OF POINT REPAIRS THAT WILL BE REQUIRED. IF SIGNIFICANT AMOUNTS ARE ANTICIPATED, PROVIDE GUIDANCE SUCH AS THE 10 PERCENT OF PROTRUDING LATERALS NOTED ABOVE AS A BASIS FOR BID FOR THE CONTRACTOR.

F. Pre-CCTV Inspection
   1. Perform a closed circuit television (CCTV) inspection of the sewer main and lateral connections prior to Service Connection Rehabilitation in accordance with Section 02761.

G. Initial Installations
   1. At a minimum, the first five SCRL installations shall be made under the supervision of the product Manufacturer's or Assembler's representative. The locations of the installations shall be determined by the Project Representative and shall be representative of typical site conditions.
   2. The initial installations shall be by the same crews and equipment to be used for the remaining installations.
   3. The Manufacturer's or Assembler's representative shall provide written and signed certification to the Project Representative ensuring that the Contractor's installations meet all requirements of the Manufacturer or Assembler and will not void the County's warranty.

NTS: NEED TO EVALUATE THE DIFFICULTY AND COST TO HAVE MANUFACTURER'S REPRESENTATIVE OBSERVING INITIAL FIELD INSTALLATIONS. THIS CAN BE A HARD REQUIREMENT TO ENFORCE BECAUSE OF SCHEDULING CONSTRAINTS.

H. Manholes
   1. Protect all sewer system components to withstand forces generated by the equipment while installing the liner.

3.02 INSTALLATION

A. Resin Impregnation
   1. Vacuum impregnate the tube with resin under controlled conditions.
   2. Use a volume of resin sufficient to fill all voids in the tube material at nominal thickness and diameter. Volume should be adjusted by adding excess resin for the change in resin volume due to polymerization and to allow for any migration of resin into the cracks and joints of the host pipe, per Manufacturer's or Assembler's recommendations.
   3. The resin impregnated tube shall be stored in such a manner that it will not be damaged, exposed to direct sunlight, exposed to any curing environment, or result in a public safety hazard. All materials shall be subject to inspection and review prior to installation.

B. SCRL Installation
   1. The installation device shall be pulled into the pipe using a cable winch or robotically transported from an access point (manhole) to the service connection point and with the use of CCTV to correctly position the device as required by the Manufacturer or Assembler.
   2. The installer shall document the placement of the liner by internal CCTV inspection with the camera being inserted from the lateral pipe down to the mainline pipe. Video documentation of the placement, prior to curing, shall be provided to the Project Representative.

C. Curing
   1. For Water, Air, or Steam Cure:
      a. After placement of the liner is complete, provide a suitable heat source and distribution equipment. The equipment shall be capable of circulating hot water, air, and/or steam throughout the section in accordance with the Manufacturer's or Assembler's recommendations to raise the temperature uniformly above the temperature required to affect a resin cure. This temperature shall be determined by the Manufacturer or Assembler based on the resin/catalyst system employed.
      b. The heat source shall be fitted with continuous monitoring thermocouples to gauge the temperature of the incoming and outgoing water, steam, and/or air supply. Water, steam, or air temperature during the cure period shall meet the requirements of the resin Manufacturer or Assembler as measured at the heat source inflow and outflow return lines.
      c. Provide standby equipment to maintain the heat source supply. The temperature during the cure shall not be less than 130 degrees Fahrenheit at the boundary between the pipe wall and the liner unless otherwise directed by the Manufacturer or Assembler to meet resin system requirements.
      d. Temperature shall be maintained during the curing period as recommended by the resin Manufacturer or Assembler, and shall follow the heating schedule supplied by the Manufacturer or Assembler.
   2. For Conductive Element Cure:
      a. After placement of the liner is complete, provide a suitable power supply. The specified power supply shall be capable of heating the section evenly to affect the proper cure of the resin in accordance with the Manufacturer's or Assembler's recommendations.
      b. The power supply and termination point shall be fitted with continuous monitoring gauges to monitor the temperature and pressure during the curing process.
      c. Provide standby equipment to maintain the power supply. The temperature during the cure shall not be less than 130 degrees Fahrenheit at the boundary between the pipe wall and the liner unless otherwise directed by the Manufacturer or Assembler to meet resin system requirements.
      d. Temperature shall be maintained during the curing period as recommended by the resin Manufacturer or Assembler, and shall follow the healing schedule supplied by the Manufacturer or Assembler.
   3. For UV Light Cure:
      a. After placement of the SCRL is complete, including the required pressurization of the placement device, provide a suitable UV light source that will completely cure the liner. The cure time shall be as required by the Manufacturer or Assembler.

D. Cool Down
   1. Cool the liner down to temperature specified by Manufacturer or Assembler following the cure period for duration specified by Manufacturer or Assembler, prior to relieving static head.
   2. Care shall be taken to ensure that a vacuum is not induced which could damage the new SCRL during the release of head on the new SCRL.

3.03 TESTING

A. Material Testing
   1. Provide one sample for every 50 SCRL installations, but no less than 2 samples per project for testing in accordance with ASTM D790. The sample shall be a cured sample in an enclosed above ground pipe and lateral to be used as a host pipe for collection of the sample. The sample shall be a random SCRL selected by the Project Representative. The above ground system shall be of length and configuration necessary to use the remote placement and curing equipment used for the actual SCRL installation.
   2. For SCRL systems where wetout of the felt is performed in the field, provide a set of two samples per each 100 SCRL's installed, or one set of two samples, whichever number is greater consisting of the following samples, taken when directed by the Project Representative.
      a. Sample of resin in its liquid, uncured form in a minimum 100 milliliter and maximum 1 gallon sealable container made of like materials as the supply container and containing a minimum 50 milliliters of sample.

b. Sample of hardener in its liquid, uncured form in similar container and sample size as Paragraph 3.03A.2.a.

NTS: THE NEED FOR MATERIAL TESTING SHOULD BE EVALUATED BY THE PROJECT REPRESENTATIVE BASED ON THE EXPERIENCE AND QUALITY OF WORK OF THE INSTALLER. TESTING OF THE FIELD SAMPLES BY THE OWNER IS VERY EXPENSIVE TO PERFORM.

B. Field Testing
1. Visual inspection of the SCRL shall be in accordance with ASTM F1743, Section 8.6.
2. After completion of all mainline lining, SCRL insertions, and finish work at the manholes, the sewer shall be CCTV inspected per Section 02761. The original recordings shall be provided to the Project Representative.
3. Repair SCRL per Manufacturer or Assembler's recommendations if defects, including infiltration of groundwater is observed.
4. All live service connections shall be accounted for and shall be unobstructed.

END OF SECTION

SECTION 02654

FOLDED/FORMED POLYVINYL CHLORIDE (PVC) PIPE

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies rehabilitation of pipelines by the installation of a polyvinyl chloride (PVC) pipe liner.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 02105: Sewer Bypassing.
   2. Section 02650: Pipeline Cleaning.
   3. Section 02653: Service Connection Rehabilitation Liner.
   4. Section 02656: Service Connection and Lateral Rehabilitation Liner
   5. Section 02761: Television Inspection of Existing and Rehabilitated Sewers.

C. Service connections may be rehabilitated with products specified in Section 02653 or 02656. Contractor shall coordinate rehabilitation of mainlines and service connections with product installers. Contractor shall ensure that PVC liner is compatible with all rehabilitation products that the liner will contact.

NTS: MODIFY SUBPARAGRAPHS B AND C AS APPROPRIATE BASED ON PROPOSED METHOD OF REINSTATING/REHABILITATING SERVICE CONNECTIONS.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents. They are part of this section insofar as specified and modified herein. In case of conflict between the requirements of this Section and the listed documents, the requirements of this Section shall prevail.

Reference	Title
ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D648	Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D1600	Standard Terminology for Abbreviated Terms Relating to Plastics
ASTM F412	Standard Terminology Relating to Plastic Piping Systems
ASTM F1871	Folded/Formed Poly (Vinyl Chloride) Pipe Type A for Existing Sewer and Conduit Rehabilitation
ASTM F1867	Practice for Installation of Folded/Formed Poly (Vinyl Chloride) (PVC) Pipe Type A for Existing Sewer and Conduit Rehabilitation

1.03 DEFINITIONS

A. Definitions are in accordance with terminology of ASTM F412, unless otherwise specified. Abbreviations are in accordance with terminology of ASTM D1600, unless otherwise specified.
   1. Service connection is the point where the lateral pipe intersects with the mainline pipe, also known as the lateral interface. It can be the interface portion of a tee, wye, or cut-in connection where the lateral pipe flows into the main.
   2. Host Pipe: An existing pipeline or conduit to be internally rehabilitated by installation of a pipe liner.
   3. Manufacturer and/or Assembler: The entity responsible for obtaining individual components of a system and assembling into the final products which are shipped to the job site for installation.

4. Installer: Licensed contractor or subcontractor responsible for the installation of the system in the field.
5. Field Superintendent: Specific person responsible for field supervision of the installation of the system.
6. Lateral and side sewers are the same as building sanitary sewer as defined in ASTM F412.

1.04 QUALIFICATIONS

A. Product, Manufacturer/Assembler, Installer, and Field Superintendent Qualification Requirements:
   1. The Manufacturer or Assembler shall have supplied the product bid for a minimum of 50,000 linear feet of installations. Contractor shall provide a list of installation projects. Also, provide the project names, owner contacts, phone numbers, and year installed.
   2. The Field Superintendent shall have been the superintendent on a minimum of 20,000 linear feet of installations with the product bid. Contractor shall provide a list of installation projects. Also, provide the project names, owner contacts, phone numbers, and year installed. The named Field Superintendent shall remain on the project through completion.
   3. The Contractor shall have a minimum of 5 years recent experience in sewer main rehabilitation, including familiarity with Folded/Formed PVC processes. Contractor shall submit list of a minimum of 5 references including contact names, phone numbers, and year installed for sewer rehabilitation projects.
   4. The Lateral Cutter Operator shall have a minimum of 6 months experience. Contractor shall submit experience of all personnel to be used as Lateral Cutter Operators.
   5. Certification showing that the Installer is currently licensed by the appropriate licensor to perform Folded/Formed PVC installation.

1.05 SUBMITTALS

A. Submit the following in accordance with Section 01300:
   1. Data sheets for each section of Folded/Formed PVC pipe liner to be installed that includes liner length, depth of installation, and liner thickness.
   2. Certification showing that the Installer is currently licensed by the appropriate licensor to perform Folded/Formed PVC pipe liner installation. Certification shall be given to the Project Representative prior to delivery of material to the job site.
   3. Details on all lining materials.
   4. Name of liner supplier.
   5. Manufacturer's or Assembler's certification that the liner materials and system are in compliance with the specifications, codes, and standards referenced herein.
   6. Manufacturer's or Assembler's recommended procedures for installation of the liner, including criteria deemed necessary to ensure proper folding of the liner when the liner is field folded.
   7. Manufacturer's or Assembler's recommendations for storage procedures and temperature control, handling and inserting the liner, details for expansion of the liner and minimum equipment requirements to allow for an adequate installation.
   8. Manufacturer's or Assembler's recommendations for minimum and maximum pressures, temperatures, and time durations to be used during liner expansion, holding periods, and cool down.
   9. Data on Contractor's equipment to be used on site including: type and tolerance of temperature gages used to monitor temperature during expansion; type and tolerance of equipment used to generate pressure during expansion; make model, and technical data of all equipment used to generate heat for the expansion process; rough size of vehicle(s) which carries the liner and installation equipment.
   10. Liner samples in accordance with Paragraph 3.04A of this section.
   11. Data-logger output in printed and electronic (excel spreadsheet) formats.
   12. Material Safety Data Sheets for all compounds or chemicals to be used on job site.

1.06 QUALITY ASSURANCE

A. The Manufacturer or Assembler shall send a representative familiar with Folded/Formed PVC pipe lining processes to the site to observe the initial five (5) installations of each product installed by the Contractor.

1. The Manufacturer or Assembler's representative shall provide certification to the Project Representative stating that the Contractor's installation methods meet the Manufacturer or Assembler's requirements.
2. After the initial installations, the product Manufacturer or Assembler's representative shall meet with the Project Representative to discuss inspection items that the Project Representative should observe and record for subsequent installations. Inspection items include pre-installation activities, product identification, installation procedures, equipment operations, and post-installation activities.

NTS: THE MANUFACTURER AND THE INSTALLER OF FOLDED/FORMED PVC PIPE LINERS FOR MAINS ARE OFTEN ONE ENTITY. IF THEY ARE DIFFERENT COMPANIES, THE NEED FOR MANUFACTURER REPRESENTATION SHOULD BE EVALUATED BY THE PROJECT REPRESENTATIVE BASED ON THE EXPERIENCE AND QUALITY OF WORK OF THE INSTALLER.

B. The finished Folded/Formed PVC pipe liner shall be continuous over the entire length of an insertion run between two manholes or access points and shall be free from visual defects such as foreign inclusions, dry spots, and pinholes.

C. Wrinkles in the finished greater than 5 percent of the pipe diameter are unacceptable and shall be removed and repaired by the Contractor at the Contractor's expense. Methods of repair shall be proposed by Contractor and submitted to the Project Representative for review.

1.07 LICENSING AND CERTIFICATION

A. The Contractor or subcontractor installing the Folded/Formed liner shall have a current license agreement with the product Manufacturer or Assembler.

B. Individuals installing the Folded/Formed liner shall be certified by the product Manufacturer or Assembler.

C. Lining installation shall be in accordance with the requirements of the product Manufacturer or Assembler and as directed by their Technical Representative. This includes the correction of defective work.

1.08 WARRANTY

A. The Contractor shall warrant each mainline, lateral, and side sewer lined with the specified product against defects in materials, surface preparation, lining application, and workmanship for a period of 18 months from the date of final acceptance of the project. The Contractor shall, within one month of written notice thereof, repair defects in materials or workmanship that may develop during said 18-month period. Defects shall be defined as: evidence of visible leakage of groundwater through the Folded/Formed lining system, or separation of any part of the Folded/Formed lining system from the host pipe to the extent that the Folded/Formed lining system inside diameter in the separated area is 95 percent or less of the completed Folded/Formed lining system inside diameter. The Contractor shall also repair any damage to other work; damage to sewer system components, damage to buildings, houses or environmental damage caused by the backup of the sewer because of the failure of the lining system.

B. Repairs shall include removal of the existing liner and re-lining if possible, or excavation and replacement of the section of pipe where the defect occurs.

PART 2 MATERIALS

2.01 FOLDED/FORMED PVC PIPE LINER

A. The liner shall consist of virgin PVC compound meeting all requirements as specified in ASTM F1871.

1. The PVC pipe liner shall be continuous in length (without joints) and the wall thickness shall be uniform.
2. The PVC pipe liner will be capable of conforming to bends.
3. The PVC pipe liner shall be marked at a distance of regular intervals along its entire length, not to exceed 5 feet. Markings shall include Manufacturer's or Assembler's name or identifying symbol.
4. The PVC pipe liner may be folded at the manufacturing facility or in the field.
5. The PVC pipe liner shall be manufactured with materials from a consistent supplier. All materials of similar type shall be from a single source for the entire project.

B. The CIPP shall be fabricated to a size that, when installed, will tightly fit the internal circumference and length of the original pipe.
   1. Allowance shall be made for circumferential stretching during the installation process.
   2. The hydraulic capacity of the PVC pipe liner shall be greater than or equal to the hydraulic capacity of the original host pipe, based on hydraulic calculations with standard engineering roughness coefficients.

C. The liner thickness shall be designed based on the engineering formulas listed in the appendix of ASTM F1867 for fully deteriorated pipes, assuming groundwater at the surface, HS-20 live loading, 120 pounds per cubic foot dry soil density, and depth of cover as determined by the adjacent upstream or downstream manhole, whichever is deeper. The thickness shall be sufficient to prevent groundwater from entering the pipe, while maintaining the maximum cross-sectional pipe area possible.

NTS: REQUIRE DESIGN BASED ON FULLY DETERIORATED PIPE OR PARTIALLY DETERIORATED PIPE PER APPENDIX OF ASTM F1867 BASED ON THE CONDITION OF THE HOST PIPE.

D. Subject to these specifications, the following manufacturers or assemblers are acceptable:
   5. Or approved equal.

NTS: COMPLETE LIST OF ACCEPTABLE MANUFACTURERS.

2.02 PHYSICAL PROPERTIES

A. The PVC pipe liner shall, upon installation inside the host pipe, exceed the minimum test standards specified by the American Society for Testing and Materials based upon restrained sample:

Physical Properties	
Tensile Strength (ASTM D638)	3,600 PSI
Tensile Modulus (ASTM D638)	155,000 PSI
Flexural Strength (ASTM D790)	4,100 PSI
Flexural Modulus (ASTM D790)	145,000 PSI
Heat Deflection (ASTM D 648)	115-deg F

The PVC pipe liner shall also meet all minimum requirements as specified in ASTM F1867.

B. The wall color of the interior pipe surface of the PVC pipe liner after installation shall be a light reflective color.

C. The hydraulic profile of the installed PVC pipe liner shall be maintained as large as possible. The CIPP shall have at a minimum the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using commonly accepted roughness coefficients for the existing pipe material taking into consideration its age and condition.

2.03 PRESSURE GROUT

A. Chemical grout designed for injection. AV-100 chemical grout as manufactured by Avanti International, or approved equal.

PART 3 EXECUTION

3.01 PREPARATION

A. Make all necessary provisions to ensure service conditions and structural conditions of host pipe are suitable for installation and warranty of the liner. Provisions shall include, but are not limited to temporary sewer bypassing, temporary service interruption of side sewers tributary to the sewer main, temporary shutdown of water service, utility coordination for interruption of water service, correction of structural defects, and adjustment of active infiltration.

B. Bypass Pumping
   1. Provide bypass pumping and diversion in accordance with Section 02105. No flow that will negatively affect the liner shall be allowed in pipe during Folded/Formed PVC pipe installation.

C. Temporary Interruption of Service
   1. Provide notification to residences of services that will be temporarily out of service, in accordance with Section 02105.
   2. Schedule service interruptions per Section 01014.
   3. Coordinate all service interruptions with the Project Representative.

D. Cleaning
   1. Clean and prepare pipe per Section 02650.
   2. Where a conflict exists between Section 02650 and the Folded/Formed PVC pipe Manufacturer's or Assembler's requirements, the Manufacturer's or Assembler's requirements shall prevail.

NTS: EFFORT BEYOND NORMAL TWO-PASS CLEANING OF THE MAIN PRIOR TO LINING, SUCH AS SIGNIFICANT ROOT CUTTING IN THE MAINS AND LATERALS, SHOULD BE NOTED IN THE SPECIFICATIONS. CONSIDER ADDING UNIT COST BID ITEMS SO THAT APPROPRIATE PAYMENT CAN BE MADE FOR ADDITIONAL EFFORT.

E. Point Repairs
   1. Repair defects in the pipeline including, but not limited to open joints, fractures, cracks, and holes in the pipeline as follows:
      a. As recommended by Manufacturer or Installer.

   2. Remove protruding laterals, rolled gaskets, roots, mineral deposits, and other objects protruding into the pipe, internally with a remote controlled cutter. Approximately 10 percent of the total number of laterals on this project are protruding and will require trimming.

NTS: PRIOR TO BIDDING, AN ASSESSMENT NEEDS TO BE MADE REGARDING THE EXTENT OF POINT REPAIRS THAT WILL BE REQUIRED. IF SIGNIFICANT AMOUNTS ARE ANTICIPATED, PROVIDE GUIDANCE SUCH AS THE 10 PERCENT OF PROTRUDING LATERALS NOTED ABOVE AS A BASIS FOR BID FOR THE CONTRACTOR.

F. Pre-CCTV Inspection
   1. Perform a closed circuit television (CCTV) inspection of the pipeline prior to liner installation in accordance with Section 02761.

G. Initial Installations
   1. The first five Folded/Formed PVC pipe installations, from manhole to manhole, shall be made under the supervision of the product Manufacturer's or Assembler's representative. The locations of the installations shall be representative of typical site conditions.
   2. Initial installations shall be by the same crews and equipment to be used for the remaining installations.
   3. The Manufacturer's or Assembler's representative shall provide written and signed certification to the Project Representative ensuring that the Contractor's installations meet all requirements of the Manufacturer or Assembler and will not void the Owner's warranty.

NTS: THE MANUFACTURER AND THE INSTALLER OF FOLDED/FORMED PVC PIPE LINERS FOR MAINS ARE OFTEN ONE ENTITY. IF THEY ARE DIFFERENT COMPANIES, THE NEED FOR MANUFACTURER REPRESENTATION SHOULD BE EVALUATED BY THE PROJECT REPRESENTATIVE BASED ON THE EXPERIENCE AND QUALITY OF WORK OF THE INSTALLER.

H. Manholes
   1. Protect all manholes to withstand forces generated by the equipment while installing the liner.

3.02 INSTALLATION

A. Liner Installation
   1. The liner shall be folded at the manufacturing plant or on the construction site, in accordance with the Manufacturer and/or Assembler's instructions.
   2. When pulling the liner into place through the existing pipe, pulling force shall be monitored and limited so that it does not exceed 50% of the yield stress at 212 deg. F.
   3. The liner installation shall meet all requirements of ASTM F1867.

B. Expansion
   1. Through the use of heat, pressure, and (if recommended) use of a squeegee or similar device, the folded pipe shall be fully expanded.
   2. Temperature, pressure, and use of the squeegee shall be per the manufacturer's requirements. Temperature and pressure shall be sufficient to press the PVC pipe liner against the wall of the existing conduit so as to neatly and tightly fit the internal circumference of the existing line and to form dimples at the service connections.
   3. The liner expansion shall meet the requirements of ASTM F1867.
   4. The heat source shall be fitted with continuous monitoring gages to measure and record the temperature of the incoming and outgoing steam, and/or air supply. Steam, or air temperature during the expansion period shall meet the requirements of the Manufacturer or Assembler as measured and recorded at the heat source inflow and outflow return lines.
   5. Provide standby equipment to maintain the heat source supply. Temperature shall be maintained during the expansion period as recommended by the Manufacturer or Assembler, and shall follow the heating schedule supplied by the Manufacturer or Assembler.

C. Cool Down
   1. Cool the liner down to temperature specified by Manufacturer or Assembler or below 100 deg. F, whichever is less, following the expansion period, prior to relieving static pressure.
   2. Care shall be taken to ensure that a vacuum is not induced which could damage the new PVC pipe liner during the release of pressure on the new liner.

D. Sealing at the Sewer Main and Manholes
   1. Provide a watertight seal between the PVC pipe liner and the host pipe at the manholes. No water shall be able to migrate between the PVC pipe liner and the host pipe.
   2. If a PVC pipe liner is installed through an intermediate manhole it shall remain continuous. After cooling, the liner within the manhole shall be cut and removed above the top of the existing channel, and the interface between the liner and channel shall be sealed with an epoxy grout.

E. PVC Pipe Liner Termination in Manholes
   1. Per details in the Drawings.

NTS: DETAILS IN THE DRAWINGS SHOULD INCLUDE A CALLOUT FOR AN EPOXYGROUT TO BE USED FOR SEALING THE PVC PIPE LINER AT THE PIPE TERMINATION TO EACH MANHOLE. THE EPOXY GROUT SHOULD BE PLACED IN THE MANHOLE AT THE INTERFACE BETWEEN THE PVC PIPE LINER AND THE EXISTING PIPE.

F. A data logger shall continuously record temperature, pressure and time during expansion, hold, and cool down at the liner insertion and termination manholes. Temperature and pressure versus time shall be plotted on a line graph and provided to the Project Representative for each lining segment.

3.03 SERVICE CONNECTION RESTORATION

A. Restore service connections (also known as reinstating service connections) to the lined pipe by one of the following methods:
   1. Internally reconnected by using a pivot-headed CCTV camera and a remote cutting tool to locate the service connections from inside the lined pipe, cutting a hole matching the service connection diameter, and grouting the area where the service connection enters the lined pipe to produce a water tight seal (except that grouting need not be performed where service connection rehabilitation liners are installed). Provide a nearly full-diameter hole, free from burrs or projections and with a smooth and crack-free edge. The hole shall be 95 percent minimum and 100 percent maximum of the original service connection inside diameter. The invert of the service connection shall match the bottom of the reinstated service opening. The CCTV during cutting shall be recorded on VHS tape and shall include a pan and tilt view of entire lateral circumference following cutting.
   2. Other remote methods as approved by the Project Representative.

3.04 TESTING

A. Material Testing
   1. Provide a rounded sample of the cooled lining material prepared at either the insertion or termination point of each length of liner installed between manholes. The sample shall be prepared as an integral part of the Folded/Formed PVC pipe and shall be taken by installing the Folded/Formed PVC pipe into a mold pipe which is of like diameter to the existing pipe. The sample shall be at least one pipe diameter long and shall be taken in accordance with the requirements of ASTM F1867.

NTS: THE NEED FOR MATERIAL TESTING SHOULD BE EVALUATED BY THE PROJECT REPRESENTATIVE BASED ON THE EXPERIENCE AND QUALITY OF WORK OF THE INSTALLER. TESTING OF THE FIELD SAMPLES BY THE OWNER IS VERY EXPENSIVE TO PERFORM.

B. Field Testing
   1. Low Pressure Air Test: The entire rehabilitated main shall be low pressure air tested prior to reinstatement of service connections as follows:
      a. The test equipment to be used shall be approved by the Project Representative prior to use. The Project Representative may at any time require a calibration test of gauges or other instrumentation that is incorporated into the test equipment. Calibration tests shall be certified by an independent testing laboratory.
      b. Plugs used to close the pipe for the air test must be securely braced to prevent the unintentional release of a plug which can become a high velocity projectile. Gauges, air piping manifold, and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole or pit where a plugged pipe is under pressure. Air testing apparatus shall be equipped with a pressure release device, such as a rupture disk or a pressure relief valve, designed to activate when the pressure in the pipe exceeds 2 psig above the required test pressure.
      c. If the pipe to be tested is submerged by groundwater, the back pressure on the pipe created by the groundwater submergence must be determined. All gauge pressures described in the test shall be increased by that amount.
      d. The first section of pipe installed by each crew shall be tested in order to qualify the crew and material. A successful test for the section shall be a prerequisite to further installation by that crew.
      e. Air shall be slowly supplied to the lined pipe section until the internal air pressure reaches 4 psig. Wait at least two minutes to allow for pressure and temperature stabilization to occur within the pipe.
      f. When the pressure decreases to 3.5 psig, the air pressure test shall begin. The test shall consist of measuring the time in seconds for the pressure in the pipe to drop from 3.5 psig to 2.5 psig. The pipe shall be considered acceptable if the time for the pressure drop is equal to or greater than 10 minutes.

g. The Contractor shall be required at no expense to King County, Utility Owner, or Facility Owner, to locate, uncover, and repair any sections failing to pass the test. The Contractor shall retest the section after replacement of the pipe.

2. Visual inspection of the Folded/Formed PVC pipe shall be in accordance with ASTM F1867, Section 7.1.
3. After completion of all Folded/Formed PVC pipe insertions, service reconnections, and finish work at the manholes, the sewer shall be video recorded per Section 02761. The original recording shall be provided to the Project Representative.
   a. Repair Folded/Formed PVC pipe per the Manufacturer and/or Assembler's recommendations if defects, including infiltration of groundwater is observed.
   b. All service connections shall be accounted for and be unobstructed.

END OF SECTION

SECTION 02656

SERVICE CONNECTION AND LATERAL REHABILITATION LINER

PART 1 GENERAL

1.01 SUMMARY

A. This Section specifies rehabilitation of the service connections and the adjacent lateral sewer pipes without excavation except to install clean outs. The repair shall consist of a one-piece full circle cured in place impregnated fabric liner, which provides a non-leaking connection at the interface of the mainline and lateral pipelines.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 02105: Sewer Bypassing
   2. Section 02650: Pipeline and Manhole Cleaning.
   3. Section 02652: Cure in Place Pipe (CIPP).
   4. Section 02761: Television Inspection of Existing and Rehabilitated Sewers.

C. Mainlines may be rehabilitated with products specified in Section 02652. Contractor shall coordinate lining of mainlines and laterals with the product installers. Contractor shall ensure that resin systems are compatible with all products they will contact.

1.02 REFERENCES

A. This Section incorporates by reference the latest revisions of the following documents. They are part of this section insofar as specified and modified herein. In case of conflict between the requirements of this Section and the listed documents, the requirements of this Section shall prevail.

Reference	Title
ASTM D543	Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D903	Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
ASTM D1600	Standard Terminology for Abbreviated Terms Relating to Plastics
ASTM D2990	Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics
ASTM D3839	Standard Practice for Underground Installation of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
ASTM F412	Standard Terminology Relating to Plastic Piping Systems
ASTM F1216	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
ASTM F1743	Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)

1.03 DEFINITIONS

A. Definitions are in accordance with terminology of ASTM F412, unless otherwise specified.
   1. Service Connection: is the point where the lateral pipe intersects with the main line pipe, also know as the lateral interface. It can be the interface portion of a tee, wye or cut in connection where the lateral pipe flows into the main.
   2. Host Pipe: An existing pipeline or conduit to be internally rehabilitated by installation of a pipe liner.

3. Manufacturer and/or Assembler: The entity responsible for obtaining individual components of a system and assembling into the final products which are shipped to the job site for installation.
4. Installer: Licensed contractor or subcontractor responsible for the installation of the system in the field.
5. Field Superintendent: Specific person responsible for the field supervision of the installation of the system.
6. Laterals and side sewers are the same as a Building Sanitary Sewer as defined in ASTM F412.B.

B. Abbreviations are in accordance with terminology of ASTM D1600, unless otherwise specified.
1. SCLRL: Service Connection and Lateral Rehabilitation Liner.

1.04 QUALIFICATIONS

A. Manufacturer or Assembler, Installer, Field Superintendent, and Contractor Qualification Requirements:
1. The Manufacturer or Assembler shall have a minimum of 200 installations of one-piece cured in place liners in North America. Contractor to provide list of installation projects. Provide the project names, owner contacts, phone numbers, and year installed.
2. The Installer shall have a minimum of 200 installations of one-piece cured in place liners in North America. Contractor to provide list of installation projects. Provide the project names, owner contacts, phone numbers, and year installed.
3. The Field Superintendent shall have a minimum of 200 installations of one-piece cured in place liners in North America. Contractor to provide Field Superintendent's name and list of installation projects. Also, provide the project names, owner contacts, phone numbers, and year installed. The named Field Superintendent shall remain on the project through completion.
4. The Contractor shall have a minimum of 5 years recent experience in sewer main rehabilitation, including familiarity with CIPP processes. Contractor shall submit list of a minimum of 5 references including contact names, phone numbers, and year installed for sewer rehabilitation projects.
5. The Lateral Cutter Operator shall have a minimum of 6 months experience. Contractor shall submit experience of all personnel to be used as Lateral Cutter Operators.
6. Certification showing that the Installer is currently licensed by the appropriate licensor to perform SCLRL installation.

1.05 SUBMITTALS

A. Submit the following in accordance with Section 01300:
1. Data sheets for each SCLRL to be installed that include SCLRL length and liner thickness.1. Certification showing that the Installer is currently licensed by the appropriate licensor to perform SCLRL installation. Certification shall be given to the Project Representative prior to delivery of material to the job site.
2. Details on all lining materials and resins.
3. Name of resin supplier and liner fabric supplier.
4. Technical data showing that the cured SCLRL system meets the chemical resistance and corrosion resistance of this specification section.
6. Manufacturer's or Assembler's certification that the SCLRL materials and system are in compliance with the specifications, codes, and standards referenced herein.
7. Manufacturer's or Assembler's recommendations for factory and field (whichever applies) wet out procedures including: volume of resin per unit of liner, mixing ratios and procedures for resin and catalyst/hardener, shelf life of resin, pot life of resin, required wet out procedure to ensure full saturation, and other criteria deemed necessary to ensure proper wet out of the liner.
8. Manufacturer's or Assembler's data sheets for factory wet out and/or Contractor's data sheets for field wet out showing: quantity of resin and catalyst used , identification number, and other criteria deemed necessary to ensure proper wet out of the liner for each length of liner.
9. Manufacturer's or Assembler's certification that all Manufacturer's or Assembler's wet out recommendations have been followed on all lengths of SCLRL which have factory wet out.
10. Manufacturer's or Assembler's recommendations for storage procedures and temperature control, handling and inserting the liner, curing details, and minimum equipment requirements to allow for an adequate installation.

11. Manufacturer's or Assembler's recommendations for minimum and maximum pressures, temperatures, and time durations to be used during SCLRL placement, cure, and cool down.
12. SCLRL samples in accordance with Paragraph 3.03A of this section.
13. Material Safety Data Sheets (MSDS) for resins, hardeners, catalysts, solvents, and other compounds or chemicals to be used on the job site.

1.06 QUALITY ASSURANCE

A. The Manufacturer or Assembler shall send a representative familiar with SCLRL processes to the site to observe at least the initial five installations of the SCLRL installed by the Contractor.
   1. The Manufacturer's or Assembler's representative shall provide certification to the Project Representative ensuring that the Contractor's installation methods meet the Manufacturer's or Assembler's requirements.
   2. After the initial installations, the product Manufacturer's or Assembler's representative shall meet with the Project Representative to discuss inspection items that the Project Representative should observe and record for subsequent installations. Inspection items include pre-installation activities, product identification, installation procedures, equipment operations, and post-installation activities.

NTS: NEED TO EVALUATE THE DIFFICULTY AND COST TO HAVE MANUFACTURER'S REPRESENTATIVE OBSERVING INITIAL FIELD INSTALLATIONS. THIS CAN BE A HARD REQUIREMENT TO ENFORCE BECAUSE OF SCHEDULING CONSTRAINTS.

B. The finished SCLRL shall be free from visual defects such as foreign inclusions, dry spots, pinholes, and delamination.

C. Wrinkles or projections in the finished SCLRL 5 percent or greater of the pipe diameter are unacceptable and shall be removed and repaired by the Contractor. Methods of repair shall be proposed by Contractor and submitted to the Project Representative for review.

1.07 LICENSING AND CERTIFICATION

A. The Contractor or subcontractor installing the SCLRL shall have a current license agreement with the product manufacturer or assembler.

B. Individuals installing the SCLRL shall be certified by the product manufacturer or assembler.

C. Lining installation shall be in accordance with the requirements of the product manufacturer or assembler and as directed by their Technical Representative. This includes the correction of defective work.

1.08 WARRANTY

A. The Contractor and SCLRL system Manufacturer or Assembler shall equally warrant each service connection and that portion of the mainline and or lateral lined with the specified product against defects in materials, surface preparation, lining application, and workmanship for a period of 3 years from the date of final acceptance of the project. The Contractor and SCLRL system Manufacturer or Assembler shall, within one month of written notice thereof, repair defects in materials or workmanship that may develop during warranty period. Defects shall be defined as: visible leakage of groundwater through the SCLRL system, visible leakage of groundwater between the SCLRL and the main cured-in-place pipelining, delamination of any portion of the SCLRL system as visible from CCTV inspection, or separation of any part of the SCLRL system from the host pipe to the extent that the SCLRL system inside diameter in the separated area is 95 percent or less of the completed SCLRL system inside diameter. The Contractor and SCLRL system manufacturer or assembler shall also repair any damage to other work; damage to sewer system components, damage to buildings, houses or environmental damage caused by the backup of the sewer because of the failure of the lining system; or repairing of the same.

B. Repairs shall include removal of the existing liner and re-lining if possible, or excavation and replacement of the section of pipe where the defect occurs, including replacement of sections of mainline or lateral pipes as needed to effectively repair the connections.

PART 2 MATERIALS

2.01 CURE IN PLACE SERVICE CONNECTION LATERAL REHABILITATION LINER

A. The SCLRL shall be one piece and consist of a lateral portion and the mainline portion with one or more layers of flexible needled felt or an equivalent non-woven material, or a combination of non-woven and woven materials capable of carrying resin, withstanding installation pressures. The liner will be continuous in length and the wall thickness shall be uniform. No overlapping sections shall be allowed in the circumference or the length of the lateral liner. The tube will be capable of conforming to offset joints, bells, and disfigured pipe sections. The mainline liner will be flat with one end overlapping the second end and sized accordingly to create a circular lining equal to the diameter of the mainline pipe.
   1. The SCLRL will be capable of conforming to the connection and into the lateral. It shall be able to stretch to fit an irregular pipe service connection.
   2. The resin shall be compatible with the liner fabric, host pipe materials, and any other rehabilitation lining system that it may contact.
   3. The SCLRL shall be manufactured with materials from a consistent supplier. All materials of similar type shall be from a single source.

B. The SCLRL shall be fabricated to a size that, when installed, will tightly fit the internal circumferences of the original pipe.
   1. Allowance shall be made for circumferential stretching during the installation process.
   2. The hydraulic capacity of the SCLRL shall be greater than or equal to the hydraulic capacity of the original host pipe, based on hydraulic calculations with standard engineering roughness coefficients.

C. The liner thickness shall be designed based on the engineering formulas listed in ASTM F1216 for ***partially deteriorated*** pipes assuming groundwater at the surface, HS-20 live loading, 120 pounds per cubic foot dry soil density, and depth of cover as determined by the adjacent upstream or downstream manhole, whichever is deeper. The thickness shall be sufficient to prevent groundwater from entering the pipe, while maintaining the maximum cross-sectional pipe area possible.

NTS: REQUIRE DESIGN BASED ON FULLY DETERIORATED PIPE OR PARTIALLY DETERIORATED PIPE PER ASTM F1216 BASED ON THE CONDITION OF THE HOST PIPE.

D. Subject to these specifications, the following manufacturer or assemblers are acceptable.
   1. T-Liner™ as manufactured by LMK Enterprises.
   2. Lateral Connection liner as manufactured by NuFlow Technologies 2000, Inc.
   3. Or approved equal.

NTS: REVIEW PRODUCTS ABOVE TO ENSURE THEY WILL MEET SPECIFIC PROJECT REQUIREMENTS. REVISE ACCEPTABLE PRODUCT MANUFACTURERS AS APPROPRIATE.

2.02 RESIN

A. A general purpose, unsaturated thermosetting polyester, vinylester, or epoxy resin compatible with the fabric liner material, host pipe material, and other rehabilitation systems that it may contact, and shall have proper catalysts and/or hardeners as designed for the specific application.

B. Resin shall meet or exceed the physical properties listed in Section 2.03.

C. Resin shall form no excessive bubbling or wrinkling during lining.

D. Resin shall be manufactured with materials from a consistent supplier. All materials of similar type shall be from a single source for the entire project.

2.03 PHYSICAL PROPERTIES

A. The composite materials of the felt liner fabric and resin shall, upon installation inside the host pipe, exceed the following minimum test standards:

Physical Properties	
Flexural Strength (ASTM D790)	4,500 psi
Flexural Modulus (ASTM D790)	250,000 psi

B. The SCLRL shall be corrosion resistant to withstand exposure to sewage gases containing quantities of hydrogen sulfide, carbon monoxide, diluted sulfuric acid, and other chemical reagents typical of sewage conveyance. Chemical resistance of the installed SCLRL shall meet the chemical resistance requirements of ASTM F1216.

C. The wall color of the interior pipe surface of the SCLRL after installation shall be a light reflective color.

D. The hydraulic profile of the installed SCLRL shall be maintained as large as possible. The SCLRL shall have at a minimum the full flow capacity of the original pipe (both mainline pipe and lateral pipe) before rehabilitation. Calculated capacities may be derived using commonly accepted roughness coefficients for the existing pipe material taking into consideration its age and condition.

PART 3 EXECUTION

3.01 PREPARATION

A. Make all necessary provisions to ensure service conditions and structural conditions of host pipe are suitable for installation and warranty of the service connection and lateral rehabilitation liner. Provisions shall include, but are not limited to temporary sewer bypassing, temporary service interruption of side sewer, temporary shutdown of water service, utility coordination for interruption of water service, correction of structural defects, and adjustment of active infiltration.

B. Bypass Pumping
   1. Provide bypass pumping and diversion per Section 02105. No flow shall be allowed in pipe during SCLRL installation.

C. Temporary Interruption of Service
   1. Provide notification to residences of services that will be temporarily out of service, per Section 02105.
   2. Schedule service interruptions per Section 01014.
   3. Coordinate all service interruptions with the Project Representative.

D. Cleaning
   1. Clean and prepare sewer main and lateral per Section 02650.
   2. Where a conflict exists between Section 02650 and the SCLRL Manufacturer's or Assembler's requirements, the Manufacturer's or Assembler's requirements shall prevail.

NTS: PRIOR TO BIDDING, AN ASSESSMENT NEEDS TO BE MADE REGARDING THE EXTENT OF ROOT CUTTING AND CLEANING OF THE LATERAL PIPES THAT WILL BE REQUIRED. IF SIGNIFICANT AMOUNTS ARE ANTICIPATED, A PARAGRAPH SHOULD BE ADDED THAT THE CONTRACTOR SHOULD ANTICIPATE ROOT REMOVAL AND CLEANING WILL BE REQUIRED IN 100% OF THE LATERALS.

E. Point Repairs
   1. Repair defects in the pipeline including, but not limited to open joints, fractures, cracks, and holes in the pipeline as follows:
      a. As recommended by Manufacturer or Installer.
   2. Remove protruding laterals, rolled gaskets, roots, mineral deposits, and other objects protruding into the pipe internally with a remote controlled cutter. ***Approximately 10 percent of the total number of laterals on this project are protruding and will require trimming.***

NTS: PRIOR TO BIDDING, AN ASSESSMENT NEEDS TO BE MADE REGARDING THE EXTENT OF POINT REPAIRS THAT WILL BE REQUIRED. IF SIGNIFICANT AMOUNTS ARE ANTICIPATED, PROVIDE GUIDANCE SUCH AS THE 10 PERCENT OF PROTRUDING LATERALS NOTED ABOVE AS A BASIS FOR BID FOR THE CONTRACTOR.

F. Pre-CCTV Inspection
   1. Perform a closed circuit television (CCTV) inspection of the pipes to be lined prior to construction rehabilitation in accordance with Section 02761.

G. Initial Installations
   1. At a minimum, the first five SCLRL installations shall be made under the supervision of the product Manufacturer's or Assembler's representative. The locations of the installations shall be determined by the Project Representative and shall be representative of typical site conditions.
   2. The initial installations shall be by the same crews and equipment to be used for the remaining installations.
   3. The Manufacturer's or Assembler's representative shall provide written and signed certification to the Project Representative ensuring that the Contractor's installations meet all requirements of the Manufacturer or Assembler and will not void the County's warranty.

NTS: NEED TO EVALUATE THE DIFFICULTY AND COST TO HAVE MANUFACTURER'S REPRESENTATIVE OBSERVING INITIAL FIELD INSTALLATIONS. THIS CAN BE A HARD REQUIREMENT TO ENFORCE BECAUSE OF SCHEDULING CONSTRAINTS.

H. Manholes
   1. Protect all sewer system components to withstand forces generated by the equipment while installing the liner.

3.02 INSTALLATION

A. Resin Impregnation
   1. Vacuum impregnate the tube with resin under controlled conditions.
   2. Use a volume of resin sufficient to fill all voids in the tube material at nominal thickness and diameter. Volume should be adjusted by adding excess resin for the change in resin volume due to polymerization and to allow for any migration of resin into the cracks and joints of the host pipe, per Manufacturer's or Assembler's recommendations.
   3. The resin impregnated tube shall be stored in such a manner that it will not be damaged, exposed to direct sunlight, exposed to any curing environment, or result in a public safety hazard. All materials shall be subject to inspection and review prior to installation.

B. SCLRL Installation
   1. The installation device shall be pulled into the pipe using a cable winch or robotically transported from the access point (manhole) to the service connection point and with the use of CCTV to correctly position the device as required by the Manufacturer or Assembler.
   2. The application of a hydrostatic head, compressed air, or other means shall fully extend the liner up the lateral.
   3. The installer shall document the placement of the liner by internal CCTV inspection. Video documentation of the placement, prior to curing, shall be provided to the Project Representative.

C. Curing
   1. For Water, Air, or Steam Cure:
      a. After placement of the liner is complete, provide a suitable heat source and distribution equipment. The equipment shall be capable of circulating hot water, air, and/or steam throughout the section in accordance with the Manufacturer's or Assembler's recommendations to raise the temperature uniformly above the temperature required to affect a resin cure. This temperature shall be determined by the Manufacturer or Assembler based on the resin/catalyst system employed.
      b. The heat source shall be fitted with continuous monitoring thermocouples to gauge the temperature of the incoming and outgoing water, steam, and/or air supply. Water, steam, or air temperature during the cure period shall meet the requirements of the resin Manufacturer or Assembler as measured at the heat source inflow and outflow return lines.
      c. Provide standby equipment to maintain the heat source supply. The temperature during the cure shall not be less than 130 degrees Fahrenheit at the boundary between the pipe wall and the liner unless otherwise directed by the Manufacturer or Assembler to meet resin system requirements.
      d. Temperature shall be maintained during the curing period as recommended by the resin Manufacturer or Assembler, and shall follow the heating schedule supplied by the Manufacturer or Assembler.

D. Cool Down
   1. Cool the liner down to temperature specified by Manufacturer or Assembler following the cure period for duration specified by Manufacturer or Assembler, prior to relieving static head.
   2. Care shall be taken to ensure that a vacuum is not induced which could damage the new SCLRL during the release of head on the new SCLRL.

3.03 TESTING

A. Material Testing
   1. Provide one sample per every 50 SCLRL installations, but no less than 2 samples for the project for testing in accordance with ASTM D790. The sample shall be a cured sample in an enclosed above ground pipe and lateral to be used as a host pipe for collection of the sample. The sample shall be a random SCLRL liner selected by the Project Representative. The above ground system shall be of length and configuration necessary to use the remote placement and curing equipment used for the actual SCLRL liner installation per ASTM D790.
   2. For SCLR liner systems where wetout of the felt is performed in the field, a set of three samples per each 50 SCLRL's installed, or one set of three samples, whichever number is greater, consisting of the following samples, shall be provided, when directed by the Project Representative.
      a. Sample of resin in its liquid, uncured form in a minimum 100 milliliter and maximum 1 gallon sealable container made of like materials as the supply container and containing a minimum 50 milliliters of sample.
      b. Sample of catalyst in its liquid, uncured form in similar container and sample size as subparagraph a.
      c. Sample of combined resin and catalyst, following mixing, in its liquid, uncured form in a similar container and sample size as subparagraph a.

NTS: THE NEED FOR MATERIAL TESTING SHOULD BE EVALUATED BY THE PROJECT REPRESENTATIVE BASED ON THE EXPERIENCE AND QUALITY OF WORK OF THE INSTALLER. TESTING OF THE FIELD SAMPLES BY THE OWNER IS VERY EXPENSIVE TO PERFORM.

B. Field Testing
   1. Visual inspection of the SCLRL shall be in accordance with ASTM F1743, Section 8.6.
   2. After completion of all mainline lining, SCLRL insertions, and finish work at the manholes, the sewer shall be CCTV inspected per Section 02761. The original tape shall be provided to the Project Representative.

3. Repair SCLRL per Manufacturer or Assembler's recommendations if defects, including infiltration of groundwater is observed.
4. All live service connections shall be accounted for and shall be unobstructed.

END OF SECTION

SECTION 02761

TELEVISION INSPECTION OF EXISTING AND REHABILITATED SEWERS

PART 1 GENERAL

1.01 SUMMARY

A. This specification defines the requirements for internal television inspection of the existing sewer mains, laterals, and side sewers before and after rehabilitation or replacement.

B. The Contractor shall inspect the sewer pipe interior using a color closed circuit television (CCTV) camera and document the inspection on video with audio location and date information, video title information, and hard copy inspection logs. A television inspection shall be performed after cleaning the sewer and prior to pipe rehabilitation. The sewer will then be CCTV inspected again in the same direction as the previous inspection after the pipe has been rehabilitated.

C. Pre-rehabilitation CCTV shall, in addition to showing condition of sewer, identify any and all wyes, tees, cleanouts, and connections.

D. Post-rehabilitation CCTV shall include written logs showing any pipe deflection, bumps, folds, tears, dimples or other defects in the rehabilitated pipe.

1.02 SUBMITTALS

A. Preliminary:
   1. The Contractor shall submit the following information for review per Section 01300 at the Pre-Construction Conference following notification of award of the Contract:
      a. An example of mainline and lateral/side sewer inspection work consisting of one video recording of previous sewer inspection work complete with audio commentary for mainline inspection and inspection log(s) for mainline and lateral/side sewer inspection. The submitted video recording shall locate all wyes, tees, cleanouts and connections. The recording and inspection logs will be reviewed to determine if the quality of the CCTV image is acceptable and if connections were properly identified and documented. Samples shall be by the same video crew supervisor with the same camera and lighting equipment proposed for this work.
      b. List of staff and equipment to be used on the project. Include manufacturer's data sheets for equipment.
      c. Contractor and video crew supervisor qualifications to determine conformance with Paragraph 02761-1.03A. Include reference projects, contact names and telephone numbers.
   2. The Contractor shall be responsible for modifications to his equipment and/or inspection procedures to achieve report material of acceptable quality. No work shall commence prior to approval of the material by the Project Representative. Once accepted, the report material shall serve as a standard for the remaining work.
   3. The tab on the video tape case which permits re-recording shall be removed prior to submittal. Contractor shall maintain a copy of all inspection documentation (recordings, databases, and logs) for the duration of the work and warranty period.

B. Other Submittals:
   1. Two copies of the finished video recordings and written logs, showing the pipes to be rehabilitated after cleaning shall be submitted to the Project Representative. The Project Representative will review the recordings, not for accuracy of content, but to make sure that the required information is provided and the recording is of acceptable quality.
   2. Two copies of the finished video recordings and written logs showing the post-construction rehabilitated sewers shall be submitted to the Project Representative. Inspected reaches shall be annotated on the video recording labels.

1.03 QUALITY ASSURANCE

A. Qualifications:
   1. Contractor: Performed work successfully for at least 5 other projects within the last 2 years, with pipe lengths and diameters similar to this project.
   2. Video Crew Supervisor: Worked on other projects similar to this project and experienced using equipment proposed for this project.
   3. Operators shall be NASCO or NARPI certified.

PART 2 PRODUCTS

2.01 GENERAL

A. Television Inspection Camera(s): Camera(s) shall be safe for operation in sewer environment and shall be operative in 100 percent humidity conditions. Lighting intensity shall be remote controlled and shall be adjusted to minimize reflective glare. Lighting and camera quality shall provide a clear, in-focus picture of the entire inside periphery of the sewer.

B. Video Recording: Video recordings of all sewer line inspections shall be made using high-quality color, 1/2-inch VHS HI format magnetic tapes or CD or DVD format. The audio portion of the composite video recording shall be sufficiently free from electrical interference and background noise to provide clear, audible verbal commentary.

C. Footage Counter: A footage counter device, which measures the distance traveled by the camera in the sewer.

D. Video Titling for Mainline Inspections: Video equipment shall include genlocking capabilities to the extent that computer generated data, (i.e., footage, date, size, address and location, etc.) as determined by the Project Representative can be overlaid onto video, and both indicated on the television monitor and permanently recorded on the inspection video recording media.

2.02 EQUIPMENT

A. Inspection Equipment for Mainlines:
   1. Television monitor.
   2. Cables.
   3. Power source.
   4. Lights.
   5. Recording Format: Color, VHS tapes or compact discs (CDs or DVDs).
   6. Resolution: 350 lines per inch, minimum; color image.
   7. Television Camera:
      a. Pan and tilt unit, with adjustable support specifically designed and constructed for operation in connection with pipe inspection.
      b. 65-degree viewing angle, minimum, and either automatic or remote focus and iris controls.
      c. Operative in 100 percent humidity conditions.
      d. Mount on skid, sized for each pipe diameter, or self-propelled.
      e. Equip with tag line suitable for pulling camera backwards.
      f. Ability to achieve proper balance of tint and brightness.
      g. Equip with power winch, TV cable, powered rewind, or other devices used to move camera through pipe.
   8. Camera Lighting:
      a. Minimize reflection.
      b. Sufficient for diameters larger than 24 inches.
      c. Lighting quality to provide clear, in-focus picture of entire inside periphery of pipe.
      d. Focal Distance: Adjustable through range from 6 inches to infinity.
   9. Remote Reading Footage Counter:
      a. Accuracy: Two-tenths of a foot over length of section being inspected.

b. Mounted over television monitor.
c. Marking on cable will not be allowed.
d. Calibration: Each day prior to setup.

B. Inspection Equipment for Laterals/Side Sewers:
1. Television monitor.
2. Recording Format: Color, VHS tapes or compact discs (CDs or DVDs).
3. Push Cables.
4. Power Source.
5. Lights.
6. Built-in locator/receiver for accurate camera location in metallic and non-metallic pipes.
7. Camera:
a. Remote focus, remote iris, and auto center position control.
b. No geometric distortion of image.
c. Proper balance of tint and brightness.
d. 70-degree diagonal lens.
e. 460 lines resolution.
8. Camera Lighting:
a. Built-in lighting.
b. Field replaceable lamps.
c. Minimize reflection.
d. Quality to provide clear, in-focus image of entire periphery of pipe.
9. Skids for mounting camera:
10. Equipped with tag line suitable for pulling camera backwards.
11. Remote Reading Footage Counter:
a. Accuracy: Two-tenths of a foot over length of section being inspected.
b. Cable marking will not be allowed.

PART 3 EXECUTION

3.01 GENERAL

A. Flow in Sewers: During CCTV inspections, and continuously until completion of construction of mains or new laterals installation and inspection, the Contractor shall provide temporary near dry conditions in the pipes.

B. Verbal Commentary: The Contractor shall record on the audio track of the video recording media, narrative of the location, upstream and downstream manhole numbers of the sewer main, laterals, house address, side sewer diameter and material, date, and time of the inspection. The location of any abandoned side sewer connections shall also be identified.

C. Access: The Project Representative shall have access to observe the monitor and all other operations at all times. Videotape, CDs and DVDs and necessary playback equipment shall be readily accessible for onsite review by the Project Representative during execution of the work. The system of cabling employed to transport the camera and transmit its signal shall not obstruct the camera's view.

D. Image Perspective: The camera image shall be down the center axis of the pipe when the camera is in motion. The Contractor is required to provide a 360-degree view of the pipe interior. Points of interest shall also be video recorded and shall include, but not be limited to, defects, encrustations, mineral deposits, debris, sediment, any location determined not to be clean or part of a proper liner installation, defects in the liner (including, but not limited to, bumps, folds, tears, dimples, etc.), or defects in new pipe installation (including, but not limited to, defective joints, gouges, or cracked pipe sections).

E. When nonremote powered and controlled winches are used to pull television camera through line, telephones; radios or other suitable means of communication shall be provided between the two manholes to ensure that adequate communications exist between crew members.

3.02 INSPECTION

A. Video Recording:
   1. Set camera so axis is at as close to centerline of pipe as possible.
   2. Show continuous footage reading on recorded image. Place on screen where it is clearly visible (e.g., if black font, do not place on dark background, if white font, do not place on light background). Place high enough on screen to be visible on image when viewing on playback equipment.
   3. Viewing shall be in direction of flow (upstream to downstream), except while camera is being used in a reverse setup due to an obstruction.
   4. If upstream (or reverse) setup is required, establish new inspection run separate from downstream (or normal) setup. Inspection video for both downstream and upstream runs shall be shown consecutively on same tape, CD or DVD.
   5. Keep camera lens clean, and clear. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with recording operation.
   6. Camera lens shall remain above visible water level and may submerge only while passing through clearly identifiable line sags (or vertical misalignments). If flow exceeds allowable percent of diameter, such that camera lens becomes obscured, inspection shall be stopped until flow subsides. If necessary, reschedule CCTV operation.
   7. Record inside of each lateral, and connection of lateral to pipeline.
   8. Mainline inspection recordings shall clearly show cracks and fractures, and their severity, in addition to obvious features, i.e., laterals and joints.
   9. Immediately report obstructions that restrict flow and cause inspection to be interrupted to the Project Representative.
   10. Camera Operation:
      a. Speed: 30 feet per minute, maximum, during inspection.
      b. Stop, for a minimum of 5 seconds, at every lateral, broken pipe, root intrusion, or other defect or adversity.
      c. Mainline Inspection: Pan entire area at each defect.
      d. Lens, lighting, and focus shall be readjusted in order to ensure clear, distinct, and properly lighted image of defect.
   11. Insert 5-second blank space between line segments to clearly mark end of one televised line and beginning of another.
   12. Mainline inspection recordings shall be without loss of color or severe red or green color will be cause for rejection of inspection.
   13. Recordings shall be without distortion or outside interference.
   14. Mainline segments shall be televised complete from structure-to-structure on same tape, CD or DVD in a continuous run. Video must clearly show camera starting and ending at structure, unless defect does not allow it. Do not perform partial televising on one tape, CD or DVD and then complete run on another.
   15. View of entire mainline segment, structure-to-structure (typically manholes) needs to exist on video in order to be acceptable, except as noted above. If a portion of line is unacceptable, entire segment shall be deemed unacceptable and shall be retelevised.
   16. Instant developing from video image, 35 mm still, digital, or other standard-size photographs illustrating significant defects shall be taken and submitted to the Project Representative. Photographs or images shall clearly indicate pipe structure identification number, footage shown on photograph with a description of the defect.
   17. The Project Representative may accept physical inspection that does not adhere to minimum standards if adverse conditions are encountered and reinspection is not advised. In such a case, enough data shall be provided to permit accurate assessment.

B. Measurement:
   1. Record in United States standard units.
   2. Obtain pipe diameter by physical measurement in upstream (or downstream) access structure.
   3. Verify pipe material (e.g., RCP, VCP, CMP) and surface lengths between manholes.

4. Use calipers or measuring rod to determine diameter of inlet and outlet pipes.
5. Footage measurements shall begin at centerline of upstream manhole and end at centerline of downstream manhole, unless specific permission by the Project Representative is given to do otherwise.
6. Continuous Footage Readings:
    a. Use to identify location of defects.
    b. Accurate to within two-tenths of a foot tolerance.
    c. Defect identifications are to be called out and recorded to the nearest 1 foot.
    d. Line segment recording will be unacceptable if continuous footage meter is inaccurate, or identified defects or features leave doubt as to accuracy of locations or total length.
7. For measurement of distance to defects, attach marker flag to top of camera yoke. Measurements recorded in log shall be zeroed in alignment with marker rather than camera itself. Measurement shall be zeroed after each segment inspected.
8. Check accuracy of measurement daily by use of walking meter, roll-a-tape, or other suitable device.
9. Loss of vertical hold, which has an impact on ability to read and interpret recording, shall constitute a cause for rejection.

3.03 DOCUMENTATION

A. Work Product:
    1. Tapes, CDs or DVDs, completed inspection log sheets, photographs, corrected inventories, corrected maps, inspection summaries, and final report.
    2. Tape or Disc Labeling:
        a. Provide typed label on outside that indicates the following:
            1) King County.
            2) Redmond Infiltration & Inflow (I/I) Pilot Project
            3) Contract C33048C.
            4) Date of Inspection.
            5) Inspection Company.
            6) Tape or Disc Number.
            7) Inspected Reaches:
                a) Mainline: Upstream manhole to downstream manhole.
                b) Lateral: Street address.
    3. Inspection Log Sheet:
        a. Complete one log for each inspected section of pipe.
        b. Provide separate inspection logs for normal and reverse setups of same segment.
        c. Other data of significance.
    4. Inventories and maps shall be corrected to reflect actual field conditions.
    5 Originals of all documentation shall be submitted to the Project Representative. Copies shall be maintained onsite.

B. Image:
    1. Color on 1/2-inch VHS HI format magnetic tape, CD or DVD format.
    2. Opening Screen on Mainline Inspection:
        a. Date of inspection.
        b. Pipe structure identification number.
        c. Upstream and downstream node identification numbers.
        d. Street address.
        e. Pipe size and material.
        f. Normal (upstream to downstream) or reverse (downstream to upstream) pull.
    3. Continuous View:
        a. Current distance along reach (tape counter footage).
        b. Do not include pipe structure identification number along active recording (only on opening screen).
    4. Audio on Mainline Inspection:
        a. Description of inspection setup, including related information from log form.
        b. Unusual conditions.

c. Operation changes (e.g., remove roots and restart inspection at footage prior to root removal).
d. Do not provide audio in a way that characterizes defect.

3.04 SEQUENCING/SCHEDULING

A. Post-rehabilitation CCTV for sewer main, lateral and side sewer lining work shall not be performed until all portions of the rehabilitation work has been completed, including rehabilitation and grouting of service connections where applicable.

B. Sewer mains rehabilitated using lining process shall be in active operation with normal flows restored to the line for a minimum of two weeks before performance post-rehabilitation CCTV.

NTS: ALLOWING LINED SEWERS TO ACTIVELY OPERATE FOR SEVERAL WEEKS BEFORE PERFORMING FINAL POST-REHABILITATION CCTV HELPS TO IDENTIFY DEFECTS IN THE LINER AND SERVICE CONNECTIONS.

3.05 QUALITY CONTROL

A. The Project Representative will review video recordings and logs to ensure compliance with the requirements listed in this specification and contract documents. If the sewer line is determined not to be adequately cleaned, as required in this section, it shall be recleaned and CCTV inspected by the Contractor. If any portion of new pipe is determined not acceptable, the new pipe shall be repaired or replaced as required by the specifications and reinspected by CCTV.

END OF SECTION

SECTION 02762

SANITARY SEWER LATERAL AND SIDE SEWER LOCATION

PART 1 GENERAL

1.01 SUMMARY

A. This specification defines the requirements for locating laterals and side sewer.

B. The Contractor shall be responsible for locating the sewer pipe between the mainline and the building plumbing.

C. For existing pipe location, the Contractor shall identify any and all fittings, including but not limited to wyes and tees, cleanouts, and backwater valves.

D. Contractor shall locate and identify all pipe segments that cannot be rehabilitated **by pipe bursting**.

NTS: SPECIFICATION WRITTEN FOR PIPE BURSTING PROJECT. REVISE AS APPROPRIATE FOR OTHER REHABILITATION TECHNOLOGIES.

1.02 SUBMITTALS

A. Preliminary:
   1. The Contractor shall submit the following information for review per Section 01300 at the Pre-Construction Conference:
      a. List of staff and equipment to be used on the project for locating. Include manufacturer's data sheets for equipment.
      b. Contractor and crew supervisor qualifications to determine conformance with Paragraph 02762-1.03A. Include reference projects, contact names and telephone numbers.
   2. The Contractor shall be responsible for modifications to his equipment and/or inspection procedures to achieve report material of acceptable quality. No work shall commence prior to approval of the material by the Project Representative. Once accepted, the report material shall serve as a standard for the remaining work.

1.03 QUALITY ASSURANCE

A. Qualifications:
   1. Contractor: Performed work successfully for at least 5 other projects within the last 2 years.
   2. Crew Supervisor: Worked on other projects similar to this project and experienced using equipment proposed for this project.

PART 2 PRODUCTS

2.01 GENERAL

A. Products used for location shall be suitable for use in sanitary sewer environments and shall be operative in 100 percent humidity conditions.

2.02 RECORDING OF DOCUMENTATION

A. Location shall be recorded per Section 01720.

PART 3 EXECUTION

3.01 GENERAL

A. Location of Lateral and Side Sewer: Sewers shall be located on a scalable map. Location shall be based on the tolerances set forth in Section 01720.

B. Location of Lateral: The Contractor shall record on the map the location of all appurtenances within the lateral and side sewer, including but not limited to cleanouts, test tees, fittings (wyes, tees, bends, etc.), and backwater valves.

C. Reach Length: Contractor shall physically measure and record on the inspection log, the length of each lateral and side sewer reach from the sewer main to the house or structure it serves.

D. Lateral Identification: All inspection documentation shall include the lateral and side sewer location and address. The Contractor shall use manhole numbers and house addresses as the identifiers.

3.02 DOCUMENTATION

A. Work Product:
   1. Completed inspection log sheets and corrected maps for each residence (house).
   2. Inspection Log Sheet:
      a. Complete one log for each house or section of pipe.
      b. Provide separate inspection logs for upstream and downstream setups of same segment.
      c. Other data of significance.
   3. Inventories and maps shall be corrected to reflect actual field conditions.
   4. Originals of all documentation shall be submitted to the Project Representative. Copies shall be maintained onsite.

3.03 QUALITY CONTROL

A. The Project Representative will review maps and inspection logs to ensure compliance with the requirements of the Contract Documents.

END OF SECTION

SECTION 02766

INSTALLATION OF SEWER BY PIPE BURSTING

PART 1 GENERAL

1.01 SUMMARY

A. This section specifies all pipe, fittings, and accessories for pipe to be installed by the pipe bursting method. The Contractor shall replace by pipe bursting the mains, laterals and side sewers indicated on the Drawings.

NTS: THERE MAY BE COST ADVANTAGES TO ALLOWING OPEN CUT INSTALLATION OF PIPE WHERE THE LENGTH OF LINE TO BE REPLACED IS LESS THAN 40 FEET, SUCH AS FOR LATERAL REPLACEMENT TO THE EDGE OF RIGHT-OF-WAY OR FOR VERY SHORT SIDE SEWERS. WHERE FEASIBLE, ALLOW THE CONTRACTOR THE CHOICE OF INSTALLATION METHODS.

B. Related Sections:
1. Section 02105: Sewer Bypassing and Dewatering.
2. Section 02160: Excavation Support Systems.
3. Section 02200: Earthwork.
4. Section 02221: Trenching, Backfilling, and Compacting.
5. Section 02761: Television Inspection of Existing and Rehabilitated Sewers.
6. Section 02910: Site Restoration.
7. Section 03600: Grout for Manhole.

1.02 REFERENCED STANDARDS

A. This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those listed documents, the requirements of this section shall prevail.

Reference	Title
ASTM D1248	Polyethylene Plastics Molding and Extrusion Materials
ASTM D2657	Heat Joining of Thermoplastic Pipe and Fittings
ASTM D3035	Polyethylene Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
ASTM D3261	Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D3350	Polyethylene Plastic Pipe and Fittings Materials
ASTM F714	Standard Specification for Polyethylene Plastic Pipe Based on Outside Diameter
ASTM F1055	Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing

1.03 HANDLING AND STORAGE

A. The Contractor shall exercise special care during the unloading, handling, and storage of all polyethylene pipe and fittings to ensure that they are not cut, gouged, scored or otherwise damaged. Any pipe segment which has cuts in the outside wall pipe wall exceeding 10 percent of the wall thickness shall be cut out and removed from the site at the Contractor's cost. The inside diameter (ID) surface shall be free of cuts, gouges, and/or scratches. The pipe shall be stored so that it is not deformed axially or circumferentially which may hinder pipe installation.

B. All polyethylene pipe and fittings without an ultraviolet inhibitor shall not be stored uncovered outside.

1.04 SUBMITTALS

A. The following submittals shall be provided in accordance with Section 01300:
   1. The Contractor shall furnish a manufacturer's certificate of compliance and specific product information showing which product is being used for all HDPE pipe and fittings and all other appurtenances furnished confirming that the materials supplied fully conform to the requirements specified herein.
   2. Insertion and receiving pit locations for all sewer mains and laterals. Submit a minimum of two weeks prior to beginning pit excavation.
   3. The Contractor shall provide all warranty information.
   4. Qualifications showing compliance with Paragraph 02766-1.05.

1.05 QUALIFICATIONS

A. The Contractor shall have a minimum of 3 years of pipe bursting experience and worked on at least 6 pipe bursting projects (totaling a cumulative 10,000 feet or more) similar to this project. Contractor shall provide a list of project names, owner contacts, phone numbers, and year installed.

B. The Field Superintendent shall have a minimum of 2 years of pipe bursting experience in the role of Field Superintendent and have supervised at least 4 pipe bursting projects (totaling a cumulative 6,000 feet or more) similar to this project. Contractor shall provide a list of project names, owner contacts, phone numbers, and year installed.

C. HDPE pipe fusion equipment shall be operated only by technicians who have attended a fusion welding training course and been certified by the pipe manufacturer and/or supplier and who have a minimum of two (2) years of experience fusion welding HDPE pipelines. Contractor shall provide resume for each operator showing experience and provide certification by pipe manufacturer and/or supplier.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: The Contractor shall provide high density polyethylene (HDPE) pipe as specified. The pipe shall be made to diameter and tolerances in accordance with ASTM D3035. The minimum ratio of orthogonal diameters prior to installation shall be 0.95. All pipe shall be made from virgin grade material. The pipe shall be of the diameter shown or specified and shall be furnished complete with all fabricated fittings, and other appurtenances as necessary for a complete and functional system.

B. Markings: Pipe materials shall be legibly marked by the pipe manufacturer. A green stripe shall be printed on either side of the pipe and shall travel the length of the pipe. The following shall be printed on the pipe:
   1. Name and trademark of manufacturer.
   2. Nominal pipe size.
   3. Dimension Ratio.
   4. The letters PE followed by the polyethylene grade per ASTM D1248, followed by the Hydrostatic Design Basis in hundreds of psi.
   5. Manufacturing Standard Reference.
   6. A production code from which the date and place of manufacture can be determined.

2.02 PIPE

A. General: Pipe shall be high molecular weight, high density polyethylene (HDPE) pipe. The material shall be listed by the Plastic Pipe Institute (PPI) with a designation of PE 3408 and have a minimum cell classification of 345434E as described in ASTM D3350. The pipe material shall meet the requirements for Type III, Class C, Category 5, Grade P34 material as described in ASTM D1248. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant

from resin of the same specification from the same raw material pipe. Pipe (excluding black colored pipe) stored outside shall not be recycled. Pipe and fittings shall be made in conformance with ASTM F714 and ASTM D3261 as modified for the specified material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It shall be uniform in density and other physical properties. Any pipe not meeting these criteria shall be rejected by the Project Representative before proceeding further.

B. Pipe Color: Pipe shall conform to the following:
   1. The inner color of the pipe shall be gray.

NTS: GRAY INTERIOR PROVIDES BETTER CLARITY FOR CCTV INSPECTION. LEAD TIME AND COST OF PIPE NEEDS TO BE CHECKED WITH MANUFACTURERS BEFORE BIDDING.

C. STANDARD DIMENSION RATIO (SDR): PIPE SHALL CONFORM TO THE FOLLOWING:

Nominal Size -	***4 inch***	***6 inch***	***8 inch***
Outside Diameter-	***4.5 inch***	***6.625 inch***	***8.625 inch***
SDR	***17***	***17***	***17***

NTS: REVISE AS REQUIRED FOR OTHER PIPE SIZES.

2.03 HDPE CONNECTORS AND COUPLINGS

A. Fusion saddles and couplings shall be made of polyethylene pipe compound that meets the requirements of ASTM D1248, Class C and suitable for fusion welding or electrofusion to polyethylene pipe. Fusion saddles shall be "Branch Saddle" by Chevron-Phillips, "Fusion Saddle" by DuPont, or approved equal.

2.04 TRANSITION COUPLINGS

A. Couplings for connection of HDPE to other pipe or fitting materials shall be one of the following, sized for transition from HDPE to the outside diameter of the joining pipe or fitting:
   1. Romac 501 manufactured by Romac Industries, Inc.
   2. Romac SS1-H manufactured by Romac Industries, Inc.
   3. DFW non-shear coupling manufactured by NDS Pro, Inc.
   4. Fernco.
   5. Approved equal.

2.05 CLEANOUTS AND CLEANOUT TEES

A. Cleanouts and cleanout tees may be constructed out of HDPE pipe and fittings conforming with requirements above.

PART 3 EXECUTION

3.01 REQUIREMENTS

A. The Contractor shall be responsible for locating all side sewers, laterals, house connections, and placement of cleanouts as indicated on the Drawings. The Contractor shall also be responsible for temporary suspension and restoration of sewer service along with property owner notification for all facilities affected.

B. This method consists of splitting the existing pipe while simultaneously installing a new High Density Polyethylene (HDPE) pipe of the same nominal inside diameter or larger diameter where the old pipe existed. The pipe bursting tool shall be designed and manufactured to force its way through the existing pipe materials by fragmenting the pipe and compressing the old pipe sections into the

surrounding soil as it progresses. The bursting unit shall be sized to allow for proper spring back of the soil onto the replacement pipe.

C. The bursting action of the tool shall increase the external dimensions sufficiently, causing breakage of the pipe while at the same time expanding the surrounding ground. This action shall not only break the pipe but also create the void into which the bursting head and pipe can be winched and enable a forward progress to be made. The void created by the bursting device shall be sufficient in size to accommodate the HDPE pipe. The HDPE pipe, directly attached to the sleeve on the rear of the bursting head, shall be installed immediately after the void has been formed. Contractor shall determine actual amount of over-expansion to provide suitable void without damaging the pipe, adjacent utilities and street, or the ground surface.

D. Only those tools designed for the aforementioned procedures, and approved by the pipe manufacturer and supplier and the Project Representative, shall be used for assembly of pipe fittings to ensure proper installation. The heater plate shall be equipped with suitable means to measure the temperature of plate surfaces and to assure uniform heating such as thermometers or pyrometers.

3.02 INSERTION AND RECEIVING PITS

A. The Contractor shall carry out all operations in strict accordance with all applicable OSHA, state and local safety standard.

B. The Contractor shall minimize the number of pits; however, sufficient number of pits shall be utilized to properly construct the project.

C. Pits shall be covered with steel plates when not in use.

D. Pits shall be backfilled and compacted in accordance with Sections 02200 and 02221.

E. Provide temporary asphalt patch and permanent asphalt restoration in accordance with Section 02513.

3.03 PIPE JOINING

A. Sections of HDPE pipe shall be joined into continuous lengths on the job site. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. Fusion equipment used in the joining procedure shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, fusion temperature, alignment and fusion pressure. Electrofusion may be used for field closures as necessary.

B. Butt fusion shall conform to ASTM D2657 and pipe manufacturer's criteria for the type of joining. Joint strength shall be greater than that of the adjacent pipe.

C. Pipe bead shall be a maximum of 1/8-inch to 3/16-inch in height for main lines and 1/8-inch to 1/4-inch in height for laterals and side sewers around the outside and inside of the entire pipe circumference. The maximum interior bead height allowed shall be 3/16-inch for main lines and 1/4-inch for laterals. Contractor shall have mechanical equipment available to remotely measure the bead height in a length of pipe and shall perform such measurements as requested by the Project Representative. If the maximum bead height is exceeded, Contractor shall mechanically remove the beads or replace the pipe section.

D. The butt-fusion method for pipe joining shall be carried out in the field by certified operators with prior experience in fusing HDPE pipe with similar equipment using proper jigs and tools per standard procedures outlined by the pipe manufacturer. It shall be the sole responsibility of the Contractor to provide an acceptable butt-fusion joint.

E. All joints shall be made available for inspection by the Project Representative before insertion into the host pipe. Contractor shall low air pressure test assembled pipe segment prior to insertion into the host pipe.

NTS: AIR TESTING OF MAINS AND LATERALS INSTALLED BY PIPE BURSTING IS VERY HARD TO ACCOMPLISH BECAUSE OF LOGISTICAL PROBLEMS IN ISOLATING NEW WORK FROM EXISTING PIPING AND GETTING INDIVIDUAL SERVICES RESTORED QUICKLY. AIR TESTING CAN BE WAIVED BY THE PROJECT REPRESENTATIVE IF THE QUALITY OF WELDING AND CONNECTING SADDLES IS SOUND, BUT THE PROVISION SHOULD STAY IN THE SPECIFICATIONS IN CASE THERE IS A QUESTION REGARDING THE QUALITY OF THE WORK.

3.04 INSTALLATION OF REPLACEMENT PIPE

A. The Contractor shall protect structures, pavement, facilities and other utilities from damage by forces generated by the pipe bursting equipment. If damage occurs, the Contractor shall repair or replace the damaged structure, pavement, or facility to its owner's satisfaction, prior to moving on to the next pipe bursting installation site.

3.05 QUALITY CONTROL

A. General:
   1. The following testing and inspection shall be required after the replacement pipe has been installed. The replacement pipe shall be tested and inspected before it has been reconnected to the manholes or laterals and prior to the installation of the new cleanouts. The Contractor shall be required to locate, uncover, repair, backfill and provide all surface restoration for any sections failing to pass the inspection or the following tests. The Contractor shall retest the section after replacement of the pipe.
      a. Mandrel Test for Main Lines: The Contractor shall pull a mandrel through the installed replacement pipe to ensure that the installed pipe has maintained roundness with minimal deflection. The testing shall be performed in the presence of the Project Representative as follows:
         1) The mandrel shall be a rigid, nonadjustable mandrel having an effective length of not less than its normal diameter and an odd-number of legs (9 legs minimum). Minimum diameter at any point along the full length of the mandrel shall be 95 percent of the base inside diameter of the pipe being tested, less than twice the maximum allowable bead height.
         2) Base inside diameter is derived by subtracting a statistical tolerance package from the average inside diameter. The tolerance package is defined as the square root of the sum of squared manufacturing tolerances. The tolerance package for controlled outside diameter pipe consists of (1) outside diameter tolerance specified in applicable ASTM Standard, (2) 12 percent of one wall thickness specified in applicable ASTM Standard, and (3) out of roundness tolerance listed in appendix of applicable ASTM Standard. When out of roundness tolerance is not listed, use 3 percent of average inside diameter.
         3) The average inside diameter for pipe with controlled outside diameter shall be equal to the average outside diameter as specified in applicable ASTM Standard minus two minimum wall thicknesses as specified in applicable ASTM Standard and minus two times excess wall tolerance of 6 percent.

NTS: THE REQUIREMENT FOR MANDREL TESTING CAN BE WAIVED BY THE PROJECT REPRESENTATIVE IF IT IS DETERMINED IN THE FIELD THAT THE QUALITY OF THE CONTRACTOR'S WORK IS HIGH-QUALITY AND THE POST-INSTALLATION CCTV INSPECTION OF THE MAIN LOOKS GOOD.

      b. Low Pressure Air Test: The entire main and side sewer pipe system shall be low pressure air tested as follows:
         1) The test equipment to be used shall be approved by the Project Representative prior to use. The Project Representative may at any time require a calibration test of gauges or

other instrumentation that is incorporated into the test equipment. Calibration tests shall be certified by an independent testing laboratory.

2) Plugs used to close the pipe for the air test must be securely braced to prevent the unintentional release of a plug which can become a high velocity projectile. Gauges, air piping manifold, and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole or pit where a plugged pipe is under pressure. Air testing apparatus shall be equipped with a pressure release device, such as a rupture disk or a pressure relief valve, designed to activate when the pressure in the pipe exceeds 2 psig above the required test pressure.
3) If the pipe to be tested is submerged by groundwater, the back pressure on the pipe created by the groundwater submergence must be determined. All gauge pressures described in the test shall be increased by that amount.
4) The first section of pipe installed by each crew shall be tested in order to qualify the crew and material. A successful test for the section shall be a prerequisite to further installation by that crew.
5) Air shall be slowly supplied to the plugged pipe section until the internal air pressure reaches 4 psig. Wait at least two minutes to allow for pressure and temperature stabilization to occur within the pipe.
6) When the pressure decreases to 3.5 psig, the air pressure test shall begin. The test shall consist of measuring the time in seconds for the pressure in the pipe to drop from 3.5 psig to 2.5 psig. The pipe shall be considered acceptable if the time in minutes for the pressure drop is equal to or greater than the required time below:
   a) 6 minutes per 100 linear feet of pipe.
   b) 24 minutes minimum per test.

NTS: AIR TESTING OF MAINS AND LATERALS INSTALLED BY PIPE BURSTING IS VERY HARD TO ACCOMPLISH BECAUSE OF LOGISTICAL PROBLEMS IN ISOLATING NEW WORK FROM EXISTING PIPING AND GETTING INDIVIDUAL SERVICES RESTORED QUICKLY. AIR TESTING CAN BE WAIVED BY THE PROJECT REPRESENTATIVE IF THE QUALITY OF WELDING AND CONNECTING SADDLES IS SOUND, BUT THE PROVISION SHOULD STAY IN THE SPECIFICATIONS IN CASE THERE IS A QUESTION REGARDING THE QUALITY OF THE WORK.

c. Ball Test for Laterals: Contractor shall pull a sewer ball through the lateral pipe. Testing shall be performed in the presence of the Project Representative. Ball diameter shall be as follows: 95 percent of the inside base diameter of the pipe, less twice the maximum allowable bead height.

NTS: BALL TESTING OF LATERALS CAN BE REPLACED WITH A PROVISION FOR POST-INSTALLATION CCTV INSPECTION OF THE LATERAL.

3.06 SADDLES

A. Fusion and electrofusion saddles shall be installed using a mechanical device (clamp) to hold the saddle against the pipe with the manufacturer's recommended amount of force during the welding and cool down process.

B. Openings for each lateral shall be cut by a device which leaves a clean, smooth edge at the transition through the saddle to the main. The coupon cut shall be removed through the saddle immediately after each cut.

3.07 SERVICE CONNECTIONS

A. After the replacement pipe has been completely installed, tested and inspected, the Contractor shall install a cleanout as shown on the drawings or as directed by the Project Representative, and connect the lateral pipe to the side sewer.

3.08 SURFACE RESTORATION

A. Upon completion of the pipe bursting operations, and installation, testing and inspection of the replacement pipe, the Contractor shall restore all areas disturbed by these operations as specified in Section 02513 and 02910.

END OF SECTION

SECTION 02910

SITE RESTORATION

PART 1 GENERAL

1.01 DESCRIPTION

A. The work includes restoration of surfaces and equipment damaged during the course of execution of this contract. The work may include such repairs as turf renovation or replacement, planting replacement, irrigation system component repair or replacement, and repairs to or replacement of other site features such as fencing, bollards, benches, sidewalks, etc., that are affected by the construction.

NTS: THIS SPECIFICATION SECTION IS GENERAL IN NATURE. REVISE AS APPROPRIATE FOR ANY SPECIFIC RESTORATION REQUIREMENTS TO BE INCLUDED.

1.02 QUALITY ASSURANCE

A. Qualifications: Landscaping work shall be by a single firm specializing in landscape work.

B. Trees, Shrubs, and Plants:
   1. Provide quantity, genus, species and variety to match existing, complying with recommendations and requirements of ANSI Z60.1., American Standard for Nursery Stock.
   2. Trees and shrubs of larger size than specified may be used if acceptable to Project Representative and if sizes of roots or balls are increased proportionately.
   3. Plants to be in vigorous health relatively free of all pests, disease, fungus, disfiguring knots, sun scalds, abrasions of the bark, broken tops, torn roots and other objectionable features. Plants cut back from larger sizes to meet specified size will not be accepted. Upon arrival to site, all plant material must show no sign of wind burn or wilt due to shipping. All plants to be nursery grown stock unless otherwise specified. Plants to have no cuts over 3/4-inch in diameter which have not completely healed over. Leader to be intact on all plants. Plants are to be of specimen quality as described by the "American Nursery Stock Standards."
   4. Where formal arrangements or consecutive order of trees or shrubs are replaced, select stock for uniform height and spread.
   5. Do not use Christmas Tree stock for evergreen plant material.

C. Availability of Materials:
   1. Submit source and proof of having secured plant materials for each plant specified to be installed 60 days before plant installation or 30 days prior to end of planting season, whichever date comes first, no exceptions.
   2. When specified landscape material is reportedly not obtainable, submit to Project Representative, proof of non-availability and a written proposal for use of similar material no later than ten working days after date of construction contract.

D. Analysis and Standards: Package standard products with manufacturer's certified analysis.

1.03 SUBMITTALS

A. Generally, submittals may consist of the following, as applicable to the work to be performed:
   1. For Turf Repair or Replacement: soil, grass seed, fertilizer, hydromulch.
   2. For Plant Replacement: soil, photographs of all plant materials, mulch.
   3. For Irrigation Replacement: catalog cuts of the components to be replaced.
   4. Certifications:
      a. Submit certificates of inspection of plant materials as required by governmental authorities having jurisdiction.

b. File inspection certificates which are required by law to accompany each shipment of plant materials from out of state with the Project Representative. Upon arrival at project site and before planting, Project Representative may inspect plant material. Replace any plants rejected by Project Representative as not conforming to specified requirements with healthy plant of type specified.
c. Submit manufacturer's or vendor's certified analysis for soil amendments and fertilizer material.
d. Submit certified analysis of lawn seed mixtures, proof of certification of seed mixture blends, and 99% weed free.

5. Submit analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable for other products.

B. Submittals in this Section may require approval of the property owners of the areas being restored. Allow an additional 14 days for these property owner approvals.

1.04 SOIL TESTING

A. Imported top-soil: When top-soil is required to be replaced, Contractor must submit a soil fertility and micronutrient analysis test for the proposed import source. The test will also provide recommendations for fertilizer and soil amendments. Contractor shall coordinate, obtain, and pay for all soil tests.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials in manufacturer's unopened containers, fully identified by name, brand, type, weight and analysis.

B. Deliver and store materials to prevent damage or intrusion of foreign matter.

C. Deliver trees, shrubs and groundcovers after preparations for planting have been completed and the irrigation system is operational. Then plant immediately.
1. Provide freshly dug trees and shrubs.
2. Protect trunks and branches from damage.
3. Protect root systems from drying out.
4. Label one of each tree and shrub variety with securely attached waterproof tag bearing legible designation, botanical name and supplier's name.
5. Do not prune prior to delivery unless otherwise approved by Project Representative.
6. Do not drop balled and burlapped stock during delivery.
7. Provide shade for plant material if planting is delayed more than 6 hours after delivery to site. Water as required to keep rootball moist.

D. Do not remove container-grown stock from containers until planting time.

E. Plants that cannot be planted within one day after arrival shall be "heeled-in" in accordance with sound horticultural practice and the following requirements:
1. Protect rootball of balled and burlapped plants with moist earth, sawdust or other acceptable material.
2. Protect plant materials at all times from extreme weather conditions and keep moist. All plants that are to be stored longer than one month shall be planted in nursery rows and maintained by Contractor at Contractor’s expense.

1.06 SITE CONDITIONS

A. Execute all work in an orderly and careful manner with due consideration for surrounding areas, plantings, or structures which are to remain.
1. Protect adjacent property and improvements from work damage.
2. Repair any damage until acceptable to Project Representative.

B. Protect improvements from damage, soiling or discoloration.

C. Examine finish grades, verify elevations, observe conditions under which work is to be performed and notify Project Representative of unsatisfactory conditions.

D. Excavation: When conditions detrimental to plant growth are encountered, such as adverse drainage conditions, notify Project Representative before proceeding.

E. Proceed with and complete the landscape work as rapidly as portions of the site become available, working within the seasonal limitations for each type of planting work required.

F. Utilities: Determine location of utilities and perform work in manner which will avoid possible damage; hand excavate as required.

G. Environmental Requirements:
   1. Plant or install materials during normal planting seasons for each type of planting required.
   2. Planting shall not be permitted during the following conditions:
      a. Cold weather: less than 32^{o} F.
      b. Hot weather: greater than 90^{o} F.
      c. Wet weather: saturated soil.
      d. Windy weather: wind velocity greater than 30 m.p.h.

H. Prepare soil only when topsoil is not saturated, muddy or frozen.

I. Seeding prior to April 15th and after October 15th may proceed only upon approval by Project Representative. Sod may be required by the Project Representative between October 15th and April 15th.

1.07 SEQUENCING/SCHEDULING

A. Provide the following notices to the Project Representative:
   1. In advance of plant material delivery so that plants may be inspected upon site delivery: 7 days.
   2. Before property owner is to assume maintenance responsibility: 7 days.
   3. In advance to time requested for approval of lawn area final surface preparation prior to seeding operation: 7 days.
   4. Before time requested for inspection for Substantial Completion: 7 days, in writing.

1.08 PLANT ESTABLISHMENT AND MAINTENANCE

A. Work in public right-of-way and on easements:
   1. Upon completion of all landscape work, the Contractor shall notify the Project Representative to inspect the site.
   2. The 60 day plant establishment and maintenance period will start immediately after the plantings have been reviewed by the Project Representative and a Punch List has been prepared.
   3. Delays greater than one week in satisfying outstanding punch list items shall constitute an extension of the 60 day maintenance period accordingly.
   4. During this 60 day period, provide fertilizer, weeding, spraying, resetting of unstable plants and other maintenance to assure healthy growth.
   5. Maintain trees, shrubs and other plants by pruning and cultivating.
      a. Weekly clean-up and weeding.
      b. Tighten and repair tree stakes and guy supports. Reset trees and shrubs to proper grades or vertical position as required.
      c. Spray as required to keep trees and shrubs free of insects and disease.
   6. Maintain lawn areas by watering, fertilizing, weeding, mowing, trimming and rolling. Regrade and replant as necessary to establish a smooth surface and growth of uniform color and density, free of eroded or bare areas.
      a. Mow irrigated lawns to a height of 1-1/2 inches after lawn has rooted in and reached a height of 2-1/2 inches; remove clippings.

b. Mow and clean up irrigated lawn areas weekly and edge every other week.

7. Following the 60-day plant establishment and maintenance period, the Contractor shall water the plant materials as necessary to ensure plant survival and to maintain healthy growth. Watering frequency shall be as required by weather conditions and plant root development. Such watering shall continue until the completion of the one year warranty period, as defined in Paragraph 3.15, this Section.

B. Work on private property:
   1. The Contractor shall hang a door hanger, to be provided by the Project Representative, on each residence immediately following completion of new landscaping, tree, and lawn restoration. Such door hanger will state that the Contractor has completed installation of new landscaping and that it is the resident's responsibility to maintain such landscaping from that point forward.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil:
   1. Provide imported two-way mix, screened, friable, natural sandy loam, consisting of 2/3 soil and 1/3 organic matter, free of subsoil, ad-mixtures or soil amendments, clay lumps or clods of hard earth, brush, weeds, stumps, roots, other litter, sticks, stones larger than 1-1/2 inches in any dimension or other extraneous material or toxic matter harmful to plant growth. Soil shall not be used in a muddy condition.
   2. All topsoil required to be stored on site prior to installation will be located in areas designated by Project Representative and approved by property owner.

B. Fertilizer: Controlled release commercial fertilizer, tablets or granular form. Complete fertilizer of neutral character, with some elements derived from organic sources and containing the following percentages of available plant nutrients:
   1. For trees and shrubs, provide fertilizer with not less than 10% total nitrogen, 10% available phosphoric acid and 10% soluble potash.
   2. For hydroseeded lawns, provide 10-20-20 fertilizer. Provide nitrogen in a form that will be available to lawn during initial growth: at least 50% of nitrogen to be in organic form.

C. Water: Suitable for irrigation, free from ingredients harmful to plant life.

D. Plants: Provide sufficient plants to restore to the conditions that existed prior to construction. Provide trees, shrubs and groundcover to replace all damaged existing plantings in like kind and number.
   1. Provide plants free of disease, injury and insect infestation, and full foliaged when in leaf.
   2. Cold storage stock is unacceptable.
   3. Container stock: Grown in container at least 6 months without root bind.
   4. Provide balled and burlapped (B&B) trees and shrubs unless otherwise indicated.
   5. Container-grown deciduous trees and shrubs will be acceptable instead of balled and burlapped deciduous trees subject to specified limitations of ANSI Z60.1 for container stock.

E. Hydroseeded Lawn Mix:
   1. Seed shall conform to the standards for "certified" grade seed or better as outlined by the State of Washington Department of Agriculture's "Rules for Seed Certification", latest edition. Seed shall be furnished in standard containers on which the following information shall be shown.
      a. Seed name.
      b. Lot number.
      c. Net weight.
      d. Percentage of purity.
      e. Percentage of germination.
      f. Percentage of weed seed content and inert material.

2. Upon Project Representative's request, furnish duplicate copies of a statement signed by the vendor certifying that each lot of seed has been tested by a recognized seed testing laboratory within six months of the date of delivery to the Project site.
3. Seed which has become wet, moldy, or otherwise damaged will not be accepted.
4. Seed Mix:
   a. Mixture to consist of: Percent by weight

Perennial Ryegrass (min. 3 varieties)	70%
Creeping Red Fescue	30%
Minimum percent germination and hard seed:	90%
Maximum percent weed seed:	0.5%

F. Sod Lawn:
   1. Provide strongly rooted sod, not less than 2 years old, free of weeds and undesirable native grasses and machine cut to pad thickness of 3/4-inch (± 1/4-inch), excluding top growth and thatch, 18-inch maximum pad width, 48-inch minimum pad length. Provide only sod capable of vigorous growth and development when planted (viable, not dormant).
      a. Provide sod of uniform pad sizes with maximum 5% deviation in either length or width. Broken pads or pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10% of pad will be rejected.
      b. Provide sod from acceptable local source. Submit list of varieties and percentages in sod mix for approval.

2.02 HYDROSEED SLURRY MATERIALS

A. Wood cellulose fiber mulch: Silver-fiber by Weyerhaeuser Company or approved equal.

B. Pre-emergent herbicide: Surflan or approved equal. Other herbicides shall be approved by Project Representative prior to application. Submit product data and purpose of use for review.

C. Tackifier: **M-Tac, AZ-TAC** or approved equal. Apply at manufacturer's recommended rate.

D. Potable water.

2.03 MULCH

A. Shall be fine, shredded granular bark, Pacific Garden Mulch, Cedar Grove compost, finely ground "Steerco" or approved equal. The moisture content shall be 40% or more, retained with normal watering or rainfall. The bark shall be free of leaves, twigs, and other debris to the satisfaction of the Project Representative. Submit sample for Project Representative's approval.

2.04 SOIL AMENDMENTS

A. Any necessary soil amendments, as determined by the results of the soil test, shall conform to the following:
   1. Lime: Agricultural dolomitic limestone containing not less than 85% of total carbonates with a minimum of 30% magnesium carbonates, ground so that not less than 90% passes a 10-mesh sieve and not less than 50% passes a 100-mesh sieve. Neutralizing value: 90% minimum.
   2. Gypsum: Horticultural grade material.
   3. Humus: Use one of the following:
      a. Manure: Use only in planting beds. Do not use in lawn areas.
      b. Mushroom compost: Provide from local source.
      c. Sawdust: A minimum of two years old, well rotted, crumbly and free of weeds, rock, sticks and other extraneous matter.
   4. Bone Meal: Commercial, raw, finely ground, 6% nitrogen, and 20% phosphoric acid.

2.05 MIXES

A. Thoroughly blend and mix the imported topsoil and soil amendment materials while in a moist condition or maintain approved premixed topsoil in moist condition.

B. Lawn Areas:
   1. Topsoil: 4 inches minimum depth, additional as needed to meet required grades, hold 1-inch below adjacent paved walks and curbs.

C. Planting Beds:
   1. Topsoil: 8-inch minimum depth, additional as needed to meet grades, hold 3 inches below adjacent paved walks, curbs and planter walls.

D. Plant Pit and Trench Backfill:
   1. Excavated soil, supplemented with topsoil. Mix shall be equal parts of each.

2.06 ACCESSORIES

A. Tree Staking Material: 2-inch by 2-inch by 10-foot lodgepole pine stake. Guy trunk to stake w/#12 galvanized wire and 1/2-inch diameter rubber hose.

B. Anti-Desiccant: Emulsion type, film-forming agent designed to permit transpiration but retard excessive loss of moisture from plants, manufactured by "Wilt-Pruf," or approved equal.

2.07 FENCE

A. Replace fencing damaged by construction activities in kind.

B. Concrete for post foundations: 2,000 psi minimum design strength.

2.08 OTHER MATERIALS

A. Other Materials to be replaced which are not covered elsewhere in these Specifications shall be replaced in-kind or with an equal or better grade as approved by the Project Representative prior to delivery to the site.

PART 3 EXECUTION

3.01 EXAMINATION

A. The Project Representative will determine the level of restoration necessary depending on the amount of damage to the existing planting, irrigation and soils. Generally, turf areas that have been driven on extensively and are bare will require replacement, whereas areas where turf is thinned or dead but still present will require reseeding only.

B. Examine for site conditions that will adversely affect execution, permanence, quality of work and survival of plants and lawns. Begin work required under this section after conditions are satisfactory; start of work denotes acceptance by Contractor, and Contractor assumes responsibility for final results.

C. Verify that grades and slopes of planting and lawn areas insure positive drainage and that they are acceptable to Project Representative prior to commencing work of this section.

D. Install plantings only after fine grading soil testing, soil preparation and amendments have been installed.

E. Proceed with and complete the planting work as rapidly as portions of the site become available, working within the seasonal limitation for each kind of planting work required.

F. Plant trees and shrubs after final grades are established, before seeding lawn.

3.02 PREPARATION

A. Protection: Protect all adjacent property and site improvements from work damage, including staining, soiling or discoloring, and replace portions damaged through this operation.

B. Surface Preparation:
   1. Locate and securely mark or flag irrigation sprinkler heads, area drains, catch basins, cleanouts, manholes, valve boxes and other site improvements not extending more than 6 inches above finish grade.
   2. Grading:
      a. Verify subgrade elevations with Project Representative prior to placement of topsoil.
      b. Limit fine grading to areas ready for planting.
      c. Bring shrub and groundcover planting areas and lawn areas to relatively smooth, even grades and slopes by dragging, hand raking and other appropriate methods. Water thoroughly to assure settlement.
      d. Establish vertical curves or rounding at abrupt changes in slope to provide a smooth and gradual grade transition.
   3. Lay out individual tree and shrub locations and areas for multiple planting. Stake or flag locations and outline areas and secure Project Representative's and property owner's acceptance before start of planting work. Make minor adjustments as may be required. .
   4. Remove and dispose of gravel, sand, debris and other deleterious materials from planting areas. Remove existing soil as necessary to place planting soil mixes to the depths specified.

3.03 REPLACING TOPSOIL

A. Planting Soils - General:
   1. Place and spread topsoil over approved areas to a depth sufficiently greater than the depth required so that after light rolling and watering, the complete work will conform to the lines, grades and elevations indicated, and shall assure proper drainage in an uninterrupted pattern free of hollows and pockets.
   2. Mix specified soil amendments and fertilizers with topsoil at rates recommended by soil tests.
   3. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.
   4. For pit and trench backfill, mix necessary soil amendments before backfilling.
   5. For planting beds, planters on grade and lawns areas: Mix planting soil prior to planting or apply on surface of topsoil and mix thoroughly before planting.
   6. Mix lime with dry soil prior to mixing of fertilizer.
   7. Prevent lime from contacting roots of acid-loving plants.

B. Tilling and Subgrade Preparation:
   1. For on-grade planting areas, loosen subgrade soil of planting beds to minimum depth of 6 inches using a cultimulcher or similar equipment. Remove stones, gravel, sticks, rubbish and other extraneous matter.
   2. Spread 1/2 depth of specified topsoil. Work into top of loosened subgrade to create a transition layer. Spread remainder of topsoil required to establish proper grade after light rolling and natural settlement.
   3. Place any necessary soil amendments and fertilizer, spread evenly and thoroughly mix/till into the bed to a depth of 4 to 6 inches.
   4. Water thoroughly to assure moist soil condition prior to plant installation.

C. Finish Grade of Planting Areas:
   1. Lawn Areas: Fill planting areas as necessary to meet required grades, except 1-inch below adjacent paved walks and curbs.
   2. Planting Beds: Fill shrub beds to meet required grades, hold 3 inches below adjacent paved walks and top of planter walls.

3.04 INSTALLATION - PLANT MATERIALS

A. Planting Trees and Shrubs:
   1. Placing:
      a. Set plant root crowns approximately 2 inches above soil surface on 6 inches of compacted prepared topsoil or compacted subgrade (scarified); deep planting not permitted. Planting depth shall allow for mulch layer and settling to position of nursery soil level.
      b. Set plants plumb and faced for best appearance.
      c. Remove any burlap, cords and fasteners from rootball tops and sides. Completely remove wire baskets. Remove rootball containers with nursery industry can cutter, cut cans on two sides. Remove wooden boxes without damage to rootballs.
      d. Neatly cut off broken and frayed roots.
   2. Backfilling:
      a. Use 1/2 backfill with 1/2 prepared topsoil, carefully tamp soil under and around rootballs; eliminate voids and air pockets.
      b. Water thoroughly before placing remainder of backfill.
      c. Complete backfilling firming to surface grade as required.
      d. Thoroughly water each plant and entire bed immediately after planting.
      e. Stake or guy trees immediately after planting as specified or shown on drawings.

3.05 HYDROSEEDING

A. All damaged lawn areas shall be hydroseeded unless approved otherwise.

B. Use commercially produced hydroseeder. Hydroseeding operator and equipment shall meet all federal, state, and local codes for backflow prevention during loading.

C. Mix seed, fertilizer, tackifier and wood cellulose fiber in required amount of water to produce a homogeneous slurry. Add wood cellulose fiber after seed, water, and fertilizer has been thoroughly mixed. Provided continuous agitation of mixture.

D. Application rates (per 1000 SF):

Fiber mulch:	45 lbs
Seed mix:	5 lbs
10-20-20 fertilizer:	10 lbs
Tackifier:	at manufacturer's recommended rates

E. Seed shall not remain in slurry longer than 6 hours or be recirculated more than 90 minutes before or during application. When applied on the ground, material shall form a blotter-like cover uniformly impregnated with grass seed. Prevent overspray into planting beds. Clean overspray material from pavement and tree trunks.

3.06 INSTALLATION - MISCELLANEOUS

A. Tree Staking: As necessary to protect newly installed trees.

B. Mulching: Provide two-inch thick minimum over entire tree, shrub and groundcover areas, within two days after planting.
   1. Prevent mulch contact with plant foliage.
   2. Place a 3-foot diameter circle of mulch around trees in lawn areas.

C. Anti-desiccant:
   1. Use anti-desiccant spray at nursery on deciduous trees or shrubs that are moved in full-leaf before moving and again 2 weeks after planting.
   2. Apply anti-desiccant using power spray to provide an adequate film over trunks, branches, stems, twigs and foliage.

3.07 INSTALLATION – OTHER SITE FEATURES

A. All other site features either damaged or destroyed during the execution of this contract shall be repaired or replaced to the satisfaction of the Project Representative and the property owner or to the installation specifications of the manufacturer of the approved replacement item.

3.08 REMOVAL AND STORAGE OF EXISTING FENCE

A. Provide controls to ensure that the fence is placed at its original locations.

B. Remove existing fence, including the concrete base and temporarily store fence on-site. Dispose of concrete base off-site.

C. Restore ground surface disturbed as a result of fence removal to original grade.

D. Erect and maintain temporary fencing or other barriers as required to protect the work area and ensure public safety.

3.09 CONCRETE POST FOUNDATION

A. Unless otherwise indicated, set all posts in concrete a minimum of 1 foot in diameter, with concrete at least 1-inch above the final grade elevation, allowing drainage away from the post.

B. Provide sono tube to meet the 1-foot requirement, if required.

C. Provide depth to match existing, minimum of 2 feet deep.

D. Do not overfill hole.

3.10 RESETTING OF FENCE

A. Resetting:
   1. Reset line posts and gate posts at original locations.
   2. The base top shall be at least 1-inch above grade and sloped for drainage.
   3. Set posts vertically.
   4. Accurately align.
   5. Make tops level or at a constant slope between changes in grade.
   6. Fit tubular posts with rain-proof malleable iron caps.

3.11 GATES

A. Reset gate to its original location.

B. Brace and truss frames.

3.12 ADJUSTING

A. Pruning: Prune, thin out and shape trees and shrubs in accordance with standard horticultural practice. Do no pruning prior to approval by Project Representative.

3.13 CLEANING

A. Keep project site reasonably free from accumulation of debris, topsoil and other materials.

B. Remove topsoil and backfill mixes from walks and paving on a daily basis.

C. Broom areas daily or as necessary to maintain clean pavement.

3.14 PROTECTION

A. Install temporary barricade of broom stakes 6 feet o.c. around perimeter of lawn areas upon completion of seeding. Tie taut with two strands of twine and flag with 12-inch strips of plastic tape at 18-inch intervals. Remove when lawn areas are established, 2 weeks minimum.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades.
   1. Maintain protection during installation and maintenance periods.
   2. Treat, repair or replace damaged landscape work as directed.

C. Reseed lawn areas that are damaged by the Contractor during the period specified above.

3.15 WARRANTY

A. Contractor shall warrant for a period of one (1) year from the date of substantial completion of the project that the plant materials used in the public right-of-way or easements are in good, healthy, and flourishing condition. During the one year warranty period, the Contractor shall replace any plant materials that are defective, have died, or failed to thrive.

END OF SECTION

SECTION 03600

GROUT FOR MANHOLES

PART 1 GENERAL

1.01 SUMMARY

A. This Section covers work, materials and equipment necessary for the installation of various types of grout for sanitary sewer manhole rehabilitation, specifically for plugging leaks, repairing voids, enhancing structural integrity, and repairing and resurfacing channels. This section includes chemical grouting, pressure grouting, grouting pipe seals, epoxy injection grouting, and use of specialized, epoxy, and cementitious patching grouts.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 02651: Manhole Rehabilitation.
   2. Section 09910: Coatings for Manholes.

1.02 REFERENCE STANDARDS

A. This Section incorporates by reference the latest revisions of the following documents. They are part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed documents, the requirements of this Section shall prevail.

Reference	Title
ASTM C33	Concrete Aggregates
ASTM C40	Test Method for Organic Impurities in Fine Aggregates for Concrete
ASTM C88	Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Test Method for Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing
ASTM C136	Test Method for Sieve Analysis of Fine and Course Aggregates
ASTM C150	Portland Cement
ASTM C289	Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
ASTM C1017	Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1244	Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
ASTM D2419	Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D4263	Standard Test Method Indicating Moisture in the Concrete by the Plastic Sheet Method
ASTM E329	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction
CRD-C-621-83	Corps of Engineers Specification for Nonshrink Grout
SSPC	Steel Structures Painting Council, Volume 1 – Good Painting Practices
NACE 6/SSPC SP 13	Joint Surface Preparation Standard – Surface Preparation of Concrete

1.03 DEFINITIONS

A. Volatile organic content (VOC): the portion of a product that is a compound of carbon, is photochemically reactive and evaporates during drying or curing, expressed in grams per liter or pounds per gallon as defined in ASTM D3960.

B. Solvents are those chemicals used to dilute a liquid product either for thinning or for cleanup.

C. Lead containing: any product that contains any detectable amount of lead.

D. Manhole wall (or barrel) shall be that part of the manhole from the base to the bottom of the cone.

E. Manhole floor is the bottom of the manhole. It usually contains channels which direct flow entering and exiting the manhole.

F. The cone shall be that part of the manhole above the wall that narrows the manhole diameter from the base diameter to the manhole frame diameter; for example, used to install a 24-inch frame on a 48-inch manhole. May be either pre-cast concrete, brick, block, and either slab-top, concentric or offset.

G. The chimney is that portion on the manhole between the top of the cone and the bottom of the frame. It is made of leveling rings or adjusting rings. This part of the manhole is typically used to allow adjustment between the top of the cone and the final grade of the asphalt. May be pre-cast concrete, HDPE, brick, or block.

H. The frame and lid are typically made of cast iron. Also known as frame and cover, or ring and cover.

I. Vacuum testing for acceptance: This involves plugging the pipes entering the manhole, installing a plug in the frame or at the top of the cone, creating a negative pressure, and monitoring the vacuum over a time interval. Testing success or failure is defined by comparison of the test results to ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill, as modified in these specifications.

J. Vacuum testing with soap: vacuum testing plus the addition of a sprayed on liquid soap over the entire interior surface of the manhole. The soap bubbles indicate the location of a leak. This work may or may not be in conjunction with vacuum testing for acceptance testing.

K. Leaks: presence of water, or indications of water, inside the manhole caused by water entering the manhole from the exterior through cracks, fractures, holes, broken seals, or other defects. Includes active leaks and seepage.

L. Inflow: water flowing into a manhole through or under the manhole lid.

1.04 QUALIFICATIONS

A. Contractor shall provide certification from the grouting system manufacturer(s) that the Applicator applying the system(s) has the training and qualifications and is approved by the manufacturer for handling, mixing, and application of the grouting system(s).

B. For chemical grouting, pressure grouting, grouting pipe seals, and epoxy injection grouting systems, Applicator shall have a minimum of three years recent experience in successfully stopping leaks and have successfully used grouting system(s) on a minimum of 50 manholes, for the purpose of eliminating infiltration in underground concrete structures. Provide a minimum of three references from similar projects and documentation of certification and experience for each grouting system. Manufacturer shall certify that the product has been manufactured for a minimum of three years and has provided satisfactory service in similar usage.

C. Applicator shall be the person responsible for the actual work, either as the field foreman or the person actually performing the grouting.

1.05 SUBMITTALS

A. Procedures: Section 01300.

B. A list of materials shall be provided before materials are delivered to the worksite. The list of materials shall include grouts, primers, activators or catalysts, fillers, solvents, and cleaners proposed for use under this Section.

C. A list of all equipment to be used shall be provided before the equipment is delivered to the worksite. Provide certification by each individual grouting system manufacturer that the application equipment is sufficient to adequately install the grout. Prior to commencing work, the contractor shall submit to the Project Representative written instructions from the manufacturer of the injection equipment as to the procedures recommended to monitor and assure its pressure control and proportioning accuracy of the unit.

D. Manufacturer's data shall be provided for the following:
   1. Cements
   2. Aggregates
   3. Bonding compounds
   4. Pressure grouts
   5. Chemical grouts
   6. Epoxy grouts
   7. Specialized grouts
   8. Retardants
   9. Primers
   10. Mix ratios
   11. Surface preparation recommendations
   12. Curing time before exposure to sewage
   13. Ventilation requirements
   14. Manufacturer’s recommended application methods
   15. Interpretation of batch code numbers
   16. Material safety data sheets (MSDS)
   17. Specialized equipment and tools

E. Quality Assurance/Quality Control Reports.

F. Applicator certification by grouting system manufacturer for each applicator of a grouting system. Provide references and documentation of applicator certification and experience.

G. For each grout and admixture, furnish a one pint sample of the components and either a one quart sample or a 6-inch cube of the cured grout if requested by the Project Representative. Field samples may be requested by the Project Representative.

H. Schedule: project schedule shall show QC and QA activities. The schedule shall allow time for remedial work to be completed as identified by inspection at the given Check Points.

1.06 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

A. General:
   1. Grout system manufacturer’s printed instructions: deviations from the manufacturer’s printed instructions will not be allowed unless approved in writing by the manufacturer’s representative and the Project Representative before execution of said change.
   2. Test result disagreement: in the event of a discrepancy between the Contractor’s, manufacturer’s, and Project Representative’s testing equipment, all parties shall check test equipment in question for proper function and calibration.
   3. Where there is a conflict between the manufacturer’s recommendations and these specifications, the manufacturer’s recommendations shall govern.
   4. The Contractor shall perform the grouting work and vacuum testing on four manholes and qualify the process, materials, and crew before proceeding with the rest of the grouting work.

B. Contractor’s responsibilities:
   1. Quality Control: Responsible for the preparation, testing, and quality control of the grout installation.
   2. Contractor shall be responsible for verifying the access route, dimensions, configuration, pipe connections, appurtenances, and details of each manhole prior to ordering any materials or commencing any work.

3. Check Points: as specified herein. The Project Representative shall be informed a minimum of 2 working days prior to the Contractor performing the tests specified.
4. Manhole Inspection Reports: Prepare and complete reports that accurately describe the ambient conditions, grout type, preparation methods, quantities applied, test results, and other information called for on the report form. Submit copies of these reports daily and within one working day of grout installation. Submit all reports in bound form at the completion of grouting work. Manhole Inspection Reports shall be on the form in Section 01999. Contractor to sign off on each Manhole Inspection Report.
5. Coordinate with the grouting system manufacturer(s).

C. Manufacturer's responsibilities:
1. Quality Control: Responsible for approving preparation, testing, and quality control of the grouting systems installed. Verify Contractor's testing procedures are sufficient to meet the requirements of the specific grouting product and these specifications.

D. Project Representative's responsibilities:
1. Quality Assurance: Document the contractor's and manufacturer's work regarding preparation and quality control of the grouting installation. This documentation in no way relieves the manufacturer and Contractor of the responsibilities described under this contract.
2. Testing: may conduct tests on grouts(s) installed, grout type, batch numbers, and other tests as determined by the Project Representative to ensure compliance with the specified requirements for grout. The County will utilize the services of an independent testing laboratory which complies with the requirements of ASTM E329. The testing laboratory will sample and test grout materials. Costs for these testing laboratory services will be borne by the County.
3. During the course of construction, the Project Representative may take field samples of these materials for confirming tests.

E. Check Points:
1. Vacuum testing with soap: Where called for in the specifications, after preparation and prior to grouting, a vacuum test with soap shall be performed by the contractor to allow documentation of existing leaks. The testing shall be performed per ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill, as modified in these specifications, except that the manhole shall not be required to pass or fail the test - the purpose of vacuum testing with soap is only to find and document leaks. Before drawing a vacuum, a sprayed-on liquid soap shall be applied over the entire interior surface of the manhole. After a vacuum is drawn, the soap will bubble up at the location of a leak. Leak locations shall be documented in the Manhole Inspection Report. Document leak location in the report using the outlet pipe as 6 o'clock and vertical measurements off the floor. This work may or may not be in conjunction with vacuum testing for acceptance testing. This test shall be performed in the presence of the Project Representative. Provide the Project Representative a minimum of 2 working days notice prior to test.

NTS: INITIAL VACUUM TESTING PRIOR TO ANY MANHOLE REHABILITATION WORK IS A MEANS TO DOCUMENT WHETHER A MANHOLE REQUIRES GROUTING OR NOT. THIS PROVISION CAN BE REMOVED IF THE MANHOLES REQUIRING REHABILITATION ARE SPECIFICALLY IDENTIFIED IN THE BID DOCUMENTS. A UNIT COST BID ITEM SHOULD BE ADDED FOR PAYMENT OF THIS WORK IF IT IS REQUIRED.

2. Vacuum testing for acceptance: Where called for in the specifications, after grout system installation a vacuum test shall be performed by the contractor. The testing shall be performed per ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill, and as modified in these specifications. This test shall be measured as pass or fail. Pass/Fail shall be documented in the Manhole Inspection Report. Failure of this test requires the contractor to repair the grout or regrout, as recommended by the manufacturer and approved by the Project Representative, and retest. This test shall use liquid soap to find and document leaks. Leak locations shall be documented on a new Manhole Inspection Report. Document leak location in the Manhole Inspectionl Report using the outlet pipe as 6 o'clock and vertical measurements off the floor. This test shall be performed in the

presence of the Project Representative. Provide the Project Representative a minimum of 2 working days notice prior to test.

F. Testing acceptance: Vacuum testing for acceptance: Pass or fail test. After each test failure repair grout or regrout and repeat test. Repeat repair and retest procedure until manhole passes vacuum test.

G. Disputes: If disputes arise between the manufacturer, Contractor and Project Representative concerning the acceptability of a given grout repair; destructive/non-destructive tests may be performed to aid in resolution of the dispute. If the grout or the grouting procedure is determined to be defective, Contractor shall be responsible for the cost of testing (including the cost of testing by an independent laboratory), the costs of re-inspection, and the costs of repairs resulting from testing. If the grouting and the grouting procedure is determined to be satisfactory, the County will be responsible for the costs of testing (including the cost of testing by an independent laboratory), and the costs of re-inspection, and the costs for repairs resulting from testing.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials for field application to the job site in their original, unopened, undamaged containers. Each container shall bear the manufacturer's name brand, batch number, date of manufacture, and storage life.

B. Grout shall be stored in enclosed structures and shall be protected from weather and excessive heat or cold, and spills. Materials exceeding storage life recommended by the manufacturer or that have been visibly damaged shall be removed from the site.

1.08 SITE CONDITIONS

A. Provide environmental controls such as heaters and/or dehumidification as necessary to meet grout application requirements.

1.09 CONTAINMENT

A. No grouting materials, solvents, chemicals, blasting media, or debris of any sort shall be allowed down the sewer. Water from pressure washing (>100 psi) may be allowed down the sewer after any debris has settled, when it demonstrated to the satisfaction of the Project Representative that no debris will flow down the sewer. Water applied at less than 100 psi and containing common, household strength detergents, that is used strictly for rinsing the interior surfaces of the manhole may be allowed down the sewer as long as no debris is washed down the sewer.

B. All odors noticeable by the average person shall be confined to an area within 10 feet of the manhole. Contractor to provide odor control equipment or methods so odors are confined and in conjunction with closed space entry or other safety requirements.

1.10 WARRANTY

A. The Contractor shall warrant each manhole grouted against defects in materials, surface preparation, grout application, and workmanship for a period of 18 months from the date of final acceptance of the project. The Contractor shall, within one month of written notice thereof, repair defects in materials or workmanship that may develop during said 18-month warranty period. Contractor shall also repair any damage to other work, damage to sewer system components (including pump stations), damage to buildings and houses, or environmental damage caused by backup of the sewer because of the failure of the grouting system, or repairing of same, at the expense of the Contractor.

PART 2 PRODUCTS

2.01 MATERIALS

A. Standardization:
   1. Materials, supplies, and articles provided shall be the standard products of manufacturers. Grouting components in a particular system shall be the products of a single manufacturer.
   2. The standard products of manufacturers other than those specified may be accepted when it is demonstrated that they are equal in composition, durability, usefulness, and convenience for the purpose intended. Requests for substitutions may be considered when submitted per Section 01300 provided the following minimum conditions are met:
      a. The proposed grouting system shall use components of the same generic type.
      b. The directions for application and descriptive literature which includes generic type, non-volatile content by volume, material safety data sheets, VOC's by weight per gallon, and other information confirms that the substitution is equal to the specified grouting system.
      c. Certified laboratory data sheets showing the results of complete spectrographic and durability tests performed on the proposed substitute. Tests shall be performed by a laboratory which conforms to the provisions of ASTM E329 and which shall be a member of the American Council of Independent Laboratories.

B. Grouting Systems
   1. Manholes to be grouted and grout system(s) to be used are specified in the Drawings. The locations of the manholes are in the Drawings.
   2. Additives may be added to the grout as recommended by the grout manufacturer to catalyze the product, control the set time, lower the freezing temperature, act as filler, provide strength, or for inhibiting root growth. All materials shall be approved by the manufacturer for use with the grout system.

2.02 CHEMICAL GROUTING

A. Chemical grout shall be a hydrophobic polyurethane grout system or hydrophilic urethane system designed for injecting into leaking cracks, voids, or fractures in concrete structures.

B. Mountain Grout "Flexible" as manufactured by Green Mountain International, Prime Resins Prime Flex 900 Series, Scotch Seal Chemical Grout 5600 (foam) or 5610 (gel) or approved equal. Contractor shall modify this system as necessary for existing conditions.

2.03 GROUTING PIPE SEALS

A. Product shall be the same as for chemical grouting.

2.04 EPOXY GROUTS

A. Epoxy grout: A three-component 100 percent-solids compound suitable for use on dry or damp surfaces, "High-Strength Grout" by the Euclid Chemical Co., "Sikadur Grout-Pak" by the Sika Chemical Co. (Sika 635), "Concresive 1380" by Adhesive Engineering, or approved equal, with stiffening additives as recommended by the grout manufacturer.

2.05 WATER FOR USE WITH GROUTS

A. Use potable water for mixing grouts.

2.06 CEMENTITIOUS PATCHING GROUTS

A. Patching grout shall be a two-component, polymer-modified, Portland-cement, fast setting, non-sag mortar, capable of use on vertical and overhead surfaces. A bonding agent shall be used per manufacturer's recommendations. SikaTop 123 PLUS or approved equal.

2.07 CEMENTITIOUS GROUTS

A. Cement:
   1. Portland cement, ASTM C150 Type II or Type V.
   2. Low alkali - containing less than 0.60 percent alkalis.

B. Aggregate:
   1. General:
      a. Non-reactive and washed before use.
      b. When sources of aggregate are changed, provide test reports for the new material. Perform the tests specified prior to commencing grout work.
   2. Fine aggregate:
      a. Hard, dense, durable particles of either sand or crushed stone regularly graded from coarse to fine.
      b. Comply with ASTM C33 as modified herein.
      c. When tested in accordance with ASTM C136, gradation shall be such that 100 percent by weight will pass a standard No. 8 mesh sieve and no less than 45 percent by weight will pass a standard No. 40 mesh sieve.
      d. Variation from the specified gradations in individual tests will be accepted if the average of 3 consecutive tests is within the specified limits and the variation is within the permissible variation listed below.

U.S. standard sieve size	Permissible variation in individual tests, percent
30 or coarser	2
50 or finer	0.5

      e. Other tests shall be in accordance with the following specifications:

Test Method	Test	Requirements
ASTM C40	Organic Impurites	Color lighter than standard
ASTM C1117	Amt. Material passing No. 200 sieve	3 percent max by weight
ASTM C88	Soundness	10 percent max loss with sodium sulfate
ASTM C289	Reactivity	Innocuous aggregate
ASTM D2419	Sand Equivalent	Minimum 80

C. Admixtures:
   1. General:
      a. Admixtures shall be compatible with the grout.
      b. Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.
      c. Use admixtures in accordance with the manufacturer's recommendations and add separately to the grout mix.
      d. Chemical admixtures for flowing concrete grout shall comply with ASTM C1017.
   2. Water reducing, retarding admixture:
      a. Acceptable manufacturer:
         1) Euclid Chemical Co., "Eucon Retarder-75".
         2) Master Builders, "Pozzolith 100 XR".
         3) Sika Chemical Corp., “Plastiment".
         4) Approved equal.
      b. The admixture shall comply with ASTM C494 Type D requirements and not contain more chloride ions than are present in municipal drinking water.
   3. Lubricant for cement pressure grouting:
      a. Acceptable manufacturer:
         1) Intrusion Prepakt, “Intrusion Aid”.
         2) Sika Chemical Corp., “Intraplast N”.
         3) Approved equal.

D. Water for washing aggregate, for mixing and for curing:

1. Shall be free from oil and deleterious amounts of acids, alkalis, and organic materials.
2. Shall not contain more than 1,000 mg/L of chlorides as Cl, nor more than 1,300 mg/L of sulfates as SO_4.
3. Shall not contain an amount of impurities that may cause a change of more than 25 percent in the setting time of the cement nor a reduction of more than 5 percent in the compressive strength of the grout at 14 days when compared with the result obtained with distilled water.
4. Water used for curing shall not contain impurities sufficient to discolor the grout.

2.08 NON-SHRINK GROUT

A. Metallic non-shrink grout: Hi-Mod Grout by the Euclid Chemical Co., Embeco 636 by Master Builders, or approved equal. Comply with CRD-C-621-83, Corps of Engineers Specification for Non-Shrink Grout.

B. Non-metallic non-shrink grout: Euco NS by the Euclid Chemical Co., Masterflow 713 by Master Builders, Five-Star Grout by U.S. Grout Corp, or approved equal. Comply with CRD-C-621-83, Corps of Engineers Specification for Non-Shrink Grout.

2.09 REPAIRS AND LINING CHANNELS

A. Patching grout shall be a two-component, polymer-modified, Portland-cement, fast setting, non-sag mortar, capable of use on vertical and horizontal surfaces. A bonding agent shall be used per manufacturer's recommendations. SikaTop 122 PLUS, SikaTop 123 PLUS, or approved equal.

B. Channels needing to be raised to match cured-in-place pipe linings shall use products specifically designed for thin (1/4-inch or less) applications, SikaTop 123 PLUS, or approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Holes or areas to be grouted shall be clean. Horizontal holes for grouting shall be drilled at a slight downward angle to facilitate holding the grout until setting is complete.

B. An epoxy adhesive shall be used with cementitious-type grout where required by the grout system manufacturer.

C. Manhole grouting shall not be performed until other repairs are completed, such as pipe bursting or cured-in-place pipe lining.

D. Contractor shall remove all roots from the manhole including those at pipe seals.

E. All cracked and spalling grout shall be removed and replaced with a waterproof quick setting mortar as recommended by the grout manufacturer.

F. Partial repairs (for example, if the Drawings call for only pipe seals to be grouted) shall not require vacuum testing.

G. Application of grout materials shall be performed by the product-specific certified grouting applicator. Damaged surfaces shall be observed by Project Representative after preparation work is complete and before repairs are made.

H. Plug or place covers over all pipe openings to prevent extraneous material from entering the sewer system. Provide bypass piping or pumping if required.

I. The Contractor shall provide the owner with dispensed samples, between 2 and 4 fluid ounces, when requested by the Project Representative. Contractor to provide sample containers.

J. For manholes required to pass a vacuum test, repair and/or re-grout manholes as required until the a passing vacuum test is obtained, at contractor's cost.

3.02 CHEMICAL GROUTING

A. Chemical grouting shall be performed from the bottom of the manhole up to the cone and shall include the joint between the cone and the bottom leveling ring.

B. Grouting, once commenced, shall be completed without stoppage. In case of breakdown of equipment, wash out the grouting system sufficiently to ensure fresh grout and adequate bond and penetration will occur upon restarting the grouting operation. Maintain grout pressure until grout has set.

C. Grout travel shall be verified by observation of grout to defects or adjacent injection holes. Provide additional holes as necessary to ensure grout travel.

D. Injection holes shall be cleaned and patched with a waterproof quick setting mortar as recommended by the grout manufacturer.

E. Testing: See Paragraph 1.06E. Check Points 1 and 2. All manholes repaired by the chemical grouting method shall be vacuum tested. Vacuum testing shall be performed on the portion of the manhole that has been chemically grouted.

3.03 GROUTING PIPE SEALS

A. Loose grout shall be removed from around the pipe seal.

B. Install same as for pressure grouting or chemical grouting, as applicable.

C. If this work is the only work specified in the Drawings for a manhole, it shall be considered a partial repair and shall not require vacuum testing.

D. Remove extruded foam. Cover pipe seal area with a minimum 1/2-inch thick layer of non-shrink grout.

3.04 EPOXY GROUTS

A. Used for repairing cracks caused by pressure grouting and repairing structural concrete.

B. Prepare substrate, mix, place, and cure grout in accordance with the manufacturer's instructions.

3.05 WATER FOR USE WITH GROUTS

A. Provide equipment for moving water and pay for water as needed.

3.06 CEMENTITIOUS PATCHING GROUTS

A. Prepare substrate, add bonding agent, mix, place, and cure grout in accordance with the manufacturer's instructions.

3.07 NON-SHRINK GROUT

A. Locations noted on the Drawings shall be grouted with the specified non-shrink grout.

B. Prepare substrate, mix, place, and cure grout in accordance with the manufacturer's instructions.

3.08 REPAIRS AND LINING CHANNELS

A. Surface preparation as required by the grout system manufacturer.

B. Prepare substrate, add bonding agent, mix, place, and cure grout in accordance with the manufacturer's instructions. Finish to a smooth surface.

C. Channels needing to be raised to match cured-in-place pipe linings (CIPP) shall provide smooth transitions, match grades between pipes, and shall not block or obstruct flows or have sharp edges to catch debris. Grout within a channel shall cover the entire interior surface of the channel from the bottom to the top edge of the channel.

3.09 CHIMENY REPAIR

A. Repair chimney using chemical grout or patching grouts as necessary to allow vacuum testing of the entire manhole.

3.10 CLEANUP

A. At the end of each shift, remove surplus materials, protective coverings, and accumulated rubbish.

B. Thoroughly clean all surfaces and repair any overspray or other grout-related damage when the work is complete for the manhole.

END OF SECTION

SECTION 09910

COATINGS FOR MANHOLES

PART 1 GENERAL

1.01 SUMMARY

A. This Section covers work, materials and equipment necessary for the installation of coatings applied to the interior of concrete and masonry sanitary sewer manholes and manhole chimneys to eliminate infiltration, provide corrosion protection, and repair voids.

B. Related Sections: The work of the following Sections is related to the work of this Section. Other Sections, not referenced below, may also be related to the proper performance of this work. It is the Contractor's responsibility to perform all the work required by the Contract Documents.
   1. Section 02650: Pipeline and Manhole Cleaning.
   2. Section 02651: Manhole Rehabilitation.
   3. Section 03600: Grout for Manholes.

1.02 REFERENCE STANDARDS

A. Referenced Standards: This Section incorporates by reference the latest revision of the following documents. They are part of this Section as specified and modified. In case of conflict between the requirements of this Section and that of the listed document, the requirements of this Section shall prevail.

Reference	Title
NACE 6/SSPC SP 13	Joint Surface Preparation Standard – Surface Preparation of Concrete
ASTM D4285	Standard Test Method for Indicating Oil or Water in Compressed Air
ASTM E329-02	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.03 DEFINITIONS

A. Coating systems: includes surface description, surface preparation, required dry film thickness, and the number and application procedure of the prime and finish coatings. Systems are in Paragraph 09910-3.06, Coating System Specification Sheets (COATSPEC).

B. Field coating: the application of the coating system in an existing manhole.

C. Dry film thickness (DFT): the thickness of a fully cured coating or coating system.

D. Wet film thickness (WFT): the thickness of a coating while wet.

E. Volatile organic content (VOC): the portion of the coating that is a compound of carbon, is photochemically reactive and evaporates during drying or curing, expressed in grams per liter or pounds per gallon as defined in ASTM D3960.

F. Solvents: Those chemicals used to dilute the liquid coating either for thinning the coating or for cleanup.

G. Lead containing: any coating that contains any detectable amount of lead.

H. Hard to reach: areas that may not be accessible with spray equipment but can be reached by brush, mitt or roller.

I. Inaccessible areas: areas such as back-to-back angles, skip welds, and other areas that a brush, mitt, or roller cannot contact the surface.

J. Manhole wall (or barrel) shall be that part of the manhole extending from the bench/wall joint to the bottom of the cone.

K. Manhole floor: the bench, channel and invert of the manhole containing the concrete/brick floor of a manhole generally shaped as a fillet to direct incoming flows to the outlet piping and to minimize solids buildup, the wall/bench joint, the shaped flow-way within the bench, the bench/channel joint and the line of lowest elevation along the bottom of the channel.

L. Manhole cone: the reducing section which tapers concentrically or eccentrically from the top wall joint to the chimney or the frame and cover sometimes referred to as corbel (when made of brick).

M. Manhole chimney: the narrow vertical section built from brick or concrete adjusting rings that extends from the top of the cone to the frame and cover.

N. Manhole frame and lid: the lid provides access to the interior of the manhole and the frame supports the cover. Typically made of cast or ductile iron. Also known as frame and cover, or ring and cover.

O. Vacuum testing for acceptance: This involves plugging the pipes entering the manhole, installing a plug in the frame or at the top of the cone, creating a negative pressure, and monitoring the vacuum over a time interval. Testing success or failure is defined by ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill and, as modified in these specifications.

P. Vacuum testing with soap: vacuum testing plus the addition of a sprayed on liquid soap over the entire interior surface of the manhole. The soap bubbles indicate the location of a leak.

Q. Leaks/Infiltration: presence of water, or indications of water, inside the manhole caused by subsurface water entering the manhole from the exterior through cracks, fractures, holes, broken seals, or other means.

R. Inflow: surface water generally entering into a manhole through or under the manhole lid, frame, frame seal, or at the frame and chimney joint.

S. Void: as defined in ACI.

T. pH: a measure of acidity and alkalinity.

U. Bug holes: small regular or irregular cavities, not exceeding 15 mm in diameter, resulting from the entrapment of air bubbles in the surface of formed concrete during placement and compaction.

1.04 QUALIFICATIONS

A. Contractor shall provide a certification from each coating system manufacturer that the Applicator applying that system has the necessary qualifications and experience using the coating system. For each interior coating systems (excluding chimney seal/coating systems) Applicator shall have a minimum of three years experience and have successfully used this product on a minimum of 100 manholes. Provide references and documentation of certification and experience.

B. Applicator shall be the person responsible for the actual work, either as the foreman or the person actually applying the coating system.

1.05 SUBMITTALS

A. Procedures: Section 01300.

B. A list of materials shall be provided before materials are delivered to the worksite. The list of materials shall include coatings, repair materials, grouts, solvents, cleaners, detergents, and blasting abrasive material proposed for use under this Section.

C. A list of all equipment shall be provided before the equipment is delivered to the worksite. Certification by the individual coating system manufacturer that the application equipment is sufficient to adequately apply the coating.

D. For each coating system, provide the manufacturer's application recommendations which shall include the following:
   1. Surface preparation recommendations.
   2. Primer type, where required.
   3. Maximum dry and wet mil thickness per coat.
   4. Minimum and maximum curing time between coats, including atmospheric conditions for each.
   5. Curing time before submergence in municipal wastewater.
   6. Thinner to be used with each coating.
   7. Ventilation requirements.
   8. Allowable application methods.
   9. Maximum storage life.
   10. Material safety data sheets.
   11. Interpretation of batch code numbers.
   12. Minimum and maximum relative humidity requirements.
   13. Minimum and maximum surface temperature requirements.
   14. Minimum and maximum ambient temperature requirements.
   15. Manufacturer's recommended application procedure.

E. Provide information on planned surface preparation procedures including, when relevant, abrasive media, minimum delivery pressure and flow rate (e.g. 5,000 psig @ 4 gpm), nozzle types (e.g. zero degree rotating nozzle), etc. for coating systems specified. Surface preparation method(s) shall be based upon the conditions of the substrate and the requirements of the protective coating to be applied. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound clean neutralized surface.

F. For each prime and finish coating, furnish a 12-inch square sample applied to concrete board. Field samples may be requested by the Project Representative.

G. Quality Assurance/Quality Control Reports.

H. Schedule: project schedule shall show QC and QA activities. The schedule shall allow time for remedial work to be completed as identified by inspection at the given Check Points.

I. List of all test equipment to be used, copies of the adhesive and equipment's instructions, adhesives, calibration procedures, MSDS sheets, and copies of all reference standards related to the test equipment.

1.06 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

A. General:
   1. Manufacturer's printed instructions: deviations from the manufacturer's printed instructions will not be allowed unless approved in writing by the manufacturer and the Project Representative before execution of said change.
   2. Test result disagreement: in the event of a discrepancy between the Contractor's, manufacturer's, and Project Representative's testing equipment, all parties shall check equipment in question for proper function and calibration.
   3. Where there is a conflict between the manufacturer's recommendations and these specifications, the manufacturer's recommendations shall govern.
   4 Test equipment and procedures shall be the same throughout the contract.
   5. Contractor shall perform the coating work and vacuum testing on four manholes and qualify the process, materials, and crew before proceeding with the rest of the coating work for the specific coating system before proceeding with the coating work for that system.

B. Contractor's responsibilities:
   1. Quality Control: responsible for the surface preparation, testing, and quality control of the coatings applied.

2. Contractor shall be responsible for verifying the access route, dimensions, configuration, pipe connections, appurtenances, and details of each manhole prior to ordering any materials or commencing any work.
3. Schedule: project schedule shall show QC and QA activities. The schedule shall allow time for remedial work to be completed as identified by inspection at the given check points.

C. Project Representative's responsibilities:
1. Quality Assurance: Approve the contractor's and manufacturer's work regarding surface preparation and quality control of the coatings applied. This documentation no way relieves the manufacturer and contractor of the responsibilities described under this contract.
2. Testing: may conduct tests on ambient conditions, pH and surface temperature, coating(s) applied, wet and dry film thickness, coating type coating batch numbers, and other tests as determined by the Project Representative.

D. Check Points:

1. Precoating vacuum testing: After surface preparation and prior to defect grouting and the coating system being applied to the interior of a manhole (excluding coatings to only the interior of a chimney and spot-type only repairs) a vacuum test with soap shall be performed by the contractor to allow documentation of existing leaks. The testing shall be performed per ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill, as modified in these specifications, except that the manhole shall not be required to pass or fail the test - the purpose of vacuum testing with soap is only to find and document leaks. Before drawing a vacuum, a sprayed-on liquid soap shall be applied over the entire interior surface of the manhole. After a vacuum is drawn, the soap will bubble up at the location of a leak. Leak locations shall be documented in the Manhole Coatings Quality Control Report. Document leak location in the Manhole Coatings Quality Control Report using the outlet pipe as 6 o'clock and vertical measurements off the floor. This work may or may not be in conjunction with vacuum testing for acceptance testing. This test shall be performed in the presence of the Project Representative. Provide the Project Representative a minimum of 2 working days notice prior to test.
2. Post coating vacuum testing: After coating system application (excluding coatings to only the interior of a chimney and spot-type only repairs) a vacuum test shall be performed by the contractor. The testing shall be performed per ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill, and as modified in these specifications. This test shall be measured as pass or fail. Pass/Fail shall be documented in the Manhole Coatings Quality Control Report. Failure of this test requires the contractor to repair the coating or recoat, as recommended by the manufacturer and approved by the Project Representative, and retest. This test shall use liquid soap to find and document leaks. Leak locations shall be documented on a new Manhole Coatings Quality Control Report. Document leak location in the Manhole Coatings Quality Control Report using the outlet pipe as 6 o'clock and vertical measurements off the floor. This test shall be performed in the presence of the Project Representative. Provide the Project Representative a minimum of 2 working days notice prior to test.
3. pH testing: After surface preparation and prior to coating system being applied to the interior of a manhole (excluding coatings to only the interior of a chimney) measure and record pH of the manhole interior surface in at least two locations as directed by the Project Representative. Adjust if required by the coating system manufacturer and per NACE 6/SSPC SP 13 Table 1 for severe service.
4. Concrete surface tensile strength: After surface preparation and prior to coating system being applied to the interior of a manhole (excluding coatings to only the interior of a chimney and spot-type only repairs) measure and record the results of a minimum of two concrete surface tensile strength tests, without glue failures, per manhole at locations as directed by the Project Representative. Tests shall be per ASTM D4541 as modified herein. Utilize a 20 mm test dolly and portable pull-off adhesion tester. Document test failure mode. Failure of the dolly adhesive shall require retesting. If the concrete surface tensile strength is less than 200 psi (NACE 6/SSPC SP 13 Table 1 for light service) notify manufacturer and Project Representative before applying coating.
5. Wet Film Thickness (WFT): During coating system application, measure and record WFT of the coating in at least four locations in the manhole (one in a chimney) or as directed by the Project

Representative. Use an industry standard WFT gage (ASTM D4414) designed for thick coatings. Minimum WFT thickness is specified in the COATSPEC section for each product.

6. Surface moisture of manhole wall or chimney before coating: After preliminary surface preparation and prior to coating system being applied to the interior of a manhole measure and record surface moisture of the manhole interior surface in at least two locations per ASTM D426 except use a DELMHORST ACCUSPAN moisture meter using a 0 to 100 relative scale. Compare to a concrete sample provided by the Project Representative.
7. Blotter test: Upon start up of abrasive blasting, compressed air shall be checked daily for oil and water by blotter test per ASTM D4285.
8. Anchor profile of an abrasive blasted surface or a high pressure water blasted surface: After preliminary surface preparation and prior to coating system being applied to the interior of a manhole (excluding coatings to only the interior of a chimney) compare and record anchor profile by comparison to various grits of sand paper.
9. Surface preparation: Shall be accepted by the coating system manufacturer prior to the application of the coating system.
10. Ambient conditions: Measure and record the test results for relative humidity, manhole wall surface temperature, dew point and ambient temperature to ensure compliance for materials applied.
11. Coating adhesion: After coating system application and cure, measure and record the results of a minimum of two adhesion tests, without glue failures, per manhole at locations within the manhole as directed by the Project Representative. Tests shall be per ASTM D4541 as modified herein. Utilize a 20 mm test dolly and portable pull-off adhesion tester. Document test failure mode, whether failure is within the concrete, failure is within the coating, or failure is at the coating/concrete interface. Failure of the dolly adhesive shall require retesting. If the testing damages the coating, spot repair the test location while following manufacturer's recommendations. Failure at the coating/concrete interface with less than 10% of substrate adhered to the coating and less than 100 psi pull-off strength, shall be deemed a coating system failure and the contractor shall remove the coating to soundly adhered edges, re-perform surface preparation procedures, and recoat the failed surfaces, at contractor's cost. Low pull-off strength values (<150 psi) may require additional testing/evaluation to determine potential adhesion defects at the sole discretion of the Project Representative.

NTS: REVISE CHECK POINTS BASED ON COATINGS TO BE APPLIED AND DESIGN CONDITIONS.

E. Disputes: If disputes arise between the manufacturer, Contractor and Project Representative concerning the acceptability of a given coating; adhesion, and other destructive/non-destructive tests may be performed to aid in resolution of the dispute. If the coating or the coating procedure is determined to be defective, Contractor shall be responsible for the cost of testing (including the cost of testing by an independent laboratory), the costs of re-inspection, and the costs of repairs resulting from testing. If the coating and the coating procedure is satisfactory, the County will be responsible for the costs of testing the repairs (including the cost of testing by an independent laboratory), the costs of repairs resulting from the inspection, and the costs of re-inspection.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver materials for field application to the job site in their original, unopened, undamaged containers. Each container shall bear the manufacturer's name brand, batch number, date of manufacture, and storage life.

B. Coatings shall be stored in enclosed structures and shall be protected from weather and excessive heat or cold, and spills. Coatings exceeding storage life recommended by the manufacturer or that have been visibly damaged shall be removed from the site.

C. Coating materials are to be stored and handled in accordance with their material safety data sheets.

1.08 SITE CONDITIONS

A. Provide environmental controls such as heaters and/or dehumidification as necessary to meet coating application requirements.

B. Supply ventilation if the cure time of the coating is slowed by the presence of coating or solvent vapor.

C. Applicator shall conform with all local, state and federal regulations including those set forth by OSHA, RCRA and the EPA and any other applicable authorities.

1.09 CONTAINMENT

A. No coating materials, solvents, chemicals, blasting media, or debris of any sort shall be allowed down the sewer. Water from pressure washing (>100 psi) may be allowed down the sewer after any debris has settled, when it is demonstrated to the satisfaction of the Project Representative that no debris will flow down the sewer. Water applied at less than 100 psi and containing common, household strength detergents, that is used strictly for rinsing the interior surfaces of the manhole may be allowed down the sewer as long as no debris is washed down the sewer.

B. All overspray shall be contained within the manhole. Dust or dry spray mists exiting the manhole shall be contained in the immediate vicinity of the manhole by means of tarps or filtration fabrics.

NTS: EVALUATE THE PRODUCTS TO BE UTILIZED FOR THE COATING INSTALLATION TO DETERMINE WHETHER ANY SPECIAL ODOR CONTAINMENT REQUIREMENTS SHOULD BE ADDED TO THE SPECIFICATION TO LIMIT MIGRATION OF ODORS FROM THE WORK AREA.

1.10 WARRANTY

A. The Contractor and coating Manufacturer shall equally warrant each manhole coated with the specified product against defects in materials, surface preparation, coating application, and workmanship for a period of 18 months from the date of final acceptance of the project. The Contractor and coating Manufacturer shall, within one month of written notice thereof, repair defects in materials or workmanship that may develop during said 18-month period. Defects shall be defined as: visible leakage of groundwater through the coating or separation of any part of the coating from the host manhole.

PART 2 PRODUCTS

2.01 MATERIALS

A. Coating Systems
   1. Manhole chimneys to be coated, coating system(s) to be used, and required finishes and colors are specified in the Drawings. The locations of the manholes are in the Drawings.
   2. Coating system shall be Product F, or G, or Product H, or approved equal.

NTS: REVISE LIST OF ACCEPTABLE COATING SYSTEMS AS APPROPRIATE.

B. Standardization:
   1. Materials, supplies, and articles provided shall be the standard products of manufacturers. Coatings in a particular system shall be the products of a single manufacturer.
   2. The standard products of manufacturers other than those specified may be accepted when it is demonstrated that they are equal in composition, durability, usefulness, and convenience for the purpose intended. Requests for substitutions may be considered when submitted per Section 01300 provided the following minimum conditions are met:
      a. The proposed coating system shall use an equal or greater number of separate coats to achieve the required dry film thickness.
      b. The proposed coating system shall use coatings of the same generic type.
      c. The directions for application and descriptive literature which includes generic type, non-volatile content by volume, material safety data sheets, VOC's by weight per gallon, and other information confirms that the substitution is equal to the specified coating system.
      d. Certified laboratory data sheets showing the results of complete physical property durability tests performed on the proposed substitute. Tests shall be performed by a laboratory which conforms to the provisions of ASTM E329 and which shall be a member of the American Council of Independent Laboratories.

e. No coating materials shall contain benzene, volatile organic compounds, isocyanates, styrenes, or lead.

C. Blasting material shall be arsenic-free and contain no free silica. Blasting material shall not be reused.

PART 3 EXECUTION

3.01 PREPARATION

A. General:
1. Surfaces to be coated shall be prepared per the coating manufacturer's recommendations. Before applying coating, all contaminants including sewage, oil, grease, dirt, rust, loose mill scale, waxes, efflorescence, sealers, salts, old weathered coatings and other foreign substances shall be removed. Oil and grease shall be removed before mechanical cleaning is started. Where mechanical cleaning is accomplished by abrasive blast cleaning, the abrasive used shall be washed, graded and free of contaminants which might interfere with the adhesion of the coatings. Steam cleaning, detergent, industrial degreasers, and hot water, shall be used to clean wall surfaces unless this is contrary to the recommendations of the specific coating system manufacturer. Acid solutions shall not be used.
2. Clean cloths and clean fluids shall be used in solvent cleaning.
3. Contractor shall inspect all surfaces specified to receive a protective coating prior to surface preparation. Contractor shall notify Project Representative of any noticeable disparity in the surfaces which may interfere with the proper preparation or application of the repair mortar and coating.
4. Damaged surfaces shall be observed by Project Representative before repairs are made.
5. Plug or place covers over all pipe openings to prevent extraneous material from entering the sewer system.

B. Surface preparation of concrete and masonry surfaces:

1. Concrete: prepare per SSPC SP13/NACE 6 "Surface Preparation for Concrete," and coating manufacturer's recommendation.
3. Loose or protruding brick, mortar and concrete shall be removed by using a mason's hammer and chisel. The surface to be repaired must be clean and free of any loose materials.
4. Bugholes, holes, and honeycombs shall be filled and sealed per recommendations of coating system manufacturer. Grout shall be as recommended by coating system manufacturer.
5. All leaks evidenced by indications of infiltration, shall be plugged with materials as recommended by coating manufacturer.
6. Surface profile created by abrasive blasted surfaces shall be per the manufacturer's recommendation for the coating system.
7. Surfaces which are to be coated shall be allowed to dry to the moisture content recommended by the coating manufacturer.
8. Steam cleaning may be used to clean wall surfaces and channels to be coated.

C. Plastic surfaces:
1. Do not coat the tread surfaces of plastic ladders or steps.

3.02 APPLICATION

A. Workmanship: Coating shall be conducted in accordance with the requirements of SSPC, Good Painting Practice, Volume 1.
1. Coated surfaces shall be free from significant runs, drips, ridges, waves, laps and brush marks, etc. Coats shall be applied so as to produce an even film of uniform thickness.
2. Coating equipment shall be designed for application of the materials specified.
a. Compressors shall have traps and filters to remove water and oils.
b. Spray equipment shall be equipped with mechanical agitators, pressure gages, and pressure regulators, and spray nozzles of the proper sizes and functioning in a manner suitable to perform the work.

c. The spray equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order. Spray application equipment must be approved by the coating manufacturer and shall be used to apply each coat of the protective coating.

3. Each coat of paint shall be applied evenly and sharply cut to line.

B. Coating properties, mixing, and thinning:
   1. Coating shall provide a monolithic film with coverage of all specified surfaces and interfacing joints. Undercoats shall be sanded to provide a surface suitable for the proper application and adhesion of subsequent coats. Overspray, pinholes and other surface defects shall be repaired.
   2. Coating shall be thoroughly stirred, strained, and kept at a uniform consistency during application.
   3. Coatings shall be mixed in accordance with the manufacturer's instructions.

C. Method of coating application:
   1. Where two or more coats are required, all coats shall be WFT tested.
   2. Coating shall not be applied to a surface until it has been prepared as specified and approved for coating by the manufacturer.

D. Film thickness and continuity:
   1. Coating system thickness is the total thickness of primer and finish coats. Coatings shall be applied to the thickness specified.
   2. Overspray, pinholes and other surface defects shall be repaired.

3.03 CLEANUP

A. At the end of each shift, remove surplus materials, protective coverings, and accumulated rubbish.

B. Thoroughly clean all surfaces and repair any overspray or other paint-related damage when the work is complete for the manhole.

3.04 PROTECTION

A. Where protection is provided for coated surfaces, such protection shall be preserved in place until the coating process has been completed and no further overspray or damage can occur to the protected surfaces. Surfaces which have been coated shall not be touched, worked on, or otherwise disturbed, until the coating is completely dry and hard.

3.05 COATING SYSTEM SPECIFICATION SHEET—COATSPEC

A. Coating Systems specified for use appear on the following pages.

Coating System Identification:	**Product C**
Manufacturer:	SAUEREISEN, Pittsburgh, PA 412-963-0303 or Fax 412-963-7620
Product name:	SEWERGARD – TROWELABLE No. 210
Qualifications:	Applicator shall be trained and certified by the manufacturer as qualified to apply the specified coating. Applicator shall have a minimum of either three years experience or a have used this product on a minimum of 100 manholes. Provide references and documentation of certification and experience with submittals.
Material classification:	Trowel-applied, 3 part mixture with pre-measured components, aggregate-filled epoxy liner.
Surfaces:	Field applied to existing manholes. Coat all of interior of existing concrete, brick, and block manholes, including channels.
Color:	As provided by manufacturer.
Compressive Strength:	7,300 psi per ASTM C579
Tensile Strength:	2,000 psi per ASTM C307
Flexural Strength:	4,900 psi per ASTM C580
Modulus of Elasticity:	2.75×10^{5} psi per ASTM C580
Coeff. Of Thermal Expansion:	$3.5 \times 10^{-5}\ F^{0}$ per ASTM C531
Bond Strength:	Shall exceed tensile strength of substrate.
Density:	113 lb/cu. ft.
Service condition:	Immersed, non-potable, non-immersed, sewage, corrosive environment, interior and exterior water pressure, traffic areas.
Surface preparation:	Per paragraph 3.01. In addition to Section 3.01, application of manufacturer recommended primer for steel and cast iron. Inject or hand pack grout to seal holes, leaks and seeping. Do not apply to surfaces that are wet (including condensation) or covered with running water. May be applied to damp surfaces.
Repair materials:	Repair with manufacturer's Patch Kit.
Environmental controls:	Range of 60 degrees F-85 degrees F air, substrate, and materials during mixing, application and curing. Maintain substrate at 60 degrees F-85 degrees F for minimum of 48 hours before beginning work. Work in shade and maintain shade from 24 hours before and until initial set. Less than 90% humidity and do not expose to water, rain or snow. Provide heaters, dehumidification, and ventilation as recommended by manufacturer and as needed to prevent condensation before and during cure. Provide sewage bypass as necessary.
Application:	Field application, manually troweled onto all surfaces by trained technician who is experienced in the application of this product and has been certified by the manufacturer. Coating applied per manufacturer's recommendations. Coating shall be applied within 48

	hours of completion of surface preparation. The finished invert surfaces shall be smooth, free of ridges and shall be sloped in the direction of flow. Special care shall be used to insure a smooth transition between the new manhole invert and intersection pipeline inverts such that flow will not be impaired.
Curing:	Comply with all manufacturer's recommendations for curing.
Thickness:	Minimum 1/8-inch thick.
Cleanup:	MEK solvent or as recommended by manufacturer. Dispose of solvent and debris as required by code.
Inspection Check Points:	See Paragraph 1.07D. Check Points 1 through 11.

NTS: REVISE CHECK POINTS AS APPROPRIATE.

Coating System Identification:	**Product D**
Manufacturer:	SAUEREISEN, Pittsburgh, PA 412-963-0303 or Fax 412-963-7620
Product name:	SEWERGARD – SPRAY APPLIED No. 210S
Qualifications:	Applicator shall be trained and certified by the manufacturer as qualified to apply the specified coating. Applicator shall have a minimum of either three years experience or a have used this product on a minimum of 100 manholes. Provide references and documentation of certification and experience with submittals.
Material classification:	Spray-applied, 2 part mixture with pre-measured components, fiber-filled epoxy liner.
Surfaces:	Field applied to existing manholes. Coat all of interior of existing concrete, brick, and block manholes, including channels.
Color:	As provided by manufacturer.
Compressive Strength:	6,800 psi per ASTM C579
Tensile Strength:	2,500 psi per ASTM C307
Flexural Strength:	4,600 psi per ASTM C580
Modulus of Elasticity:	$3.3x10^5$ psi per ASTM C580
Coeff. Of Thermal Expansion:	$3.8x10^{-5}$ F^0 per ASTM C531
Bond Strength:	Shall exceed tensile strength of substrate.
Density:	77 lb/cu. ft.
Shrinkage:	0.2% per ASTM C531
Service condition:	Immersed, non-potable, non-immersed, sewage, corrosive environment, interior and exterior water pressure, traffic areas.
Surface preparation:	Per paragraph 3.01. In addition to Section 3.01, application of manufacturer recommended primer for steel and cast iron. Inject or hand pack grout to seal holes, leaks and seeping. Do not apply to surfaces that are wet (including condensation) or covered with running water. Vacuum surfaces if abrasive blasting or high pressure water blasting is used. Steel and cast iron shall be abrasive blasted to a nominal 2.5 mils profile per SSPC-SP5 White Metal Blast for immersion and SSPC-SP10 for other surfaces. Grind welds and sharp edges smooth. Application of manufacturer recommended primer for steel and cast iron.
Repair materials:	If holiday testing indicates pinholes exist, repair with manufacturer's Patch Kit.
Environmental controls:	Range of 65 degrees F-80 degrees F air, substrate, and materials during mixing, application and curing. Maintain substrate at 608F-858F for minimum of 48 hours before beginning work. Work in shade and maintain shade from 24 hours before and until initial set. Less than 90% humidity and do not expose to water, rain or snow. Provide heaters, dehumidification, and ventilation as recommended

	by manufacturer and as needed to prevent condensation before and during cure. Provide sewage bypass as necessary.
Application:	Field application, sprayed onto all surfaces by trained technician who is experienced in the application of this product and has been certified by the manufacturer. Coating applied per manufacturer's recommendations. Coating shall be applied within 48 hours of completion of surface preparation. The finished invert surfaces shall be smooth, free of ridges and shall be sloped in the direction of flow. Special care shall be used to insure a smooth transition between the new manhole invert and intersection pipeline inverts such that flow will not be impaired. Manufacturer to certify equipment proposed for use by Contractor .
Curing:	Comply with all manufacturer's recommendations for curing.
Thickness:	Minimum 60 mils thick.
Cleanup:	MEK solvent or as recommended by manufacturer. Dispose of solvent and debris as required by code.
Inspection Check Points:	See Paragraph 1.07D. Check Points 1 through 11.

NTS: REVISE CHECK POINTS AS APPROPRIATE.

Coating System Identification:	**Product E**
Manufacturer:	SPRAYROQ, Inc., Birmingham, AL. 205-957-0020 or Fax 205-957-0021
Product name:	SPRAYWALL Polyurethane
Qualifications:	Applicator shall be trained and certified by the manufacturer as qualified to apply the specified coating. Applicator shall have a minimum of either three years experience or a have used this product on a minimum of 100 manholes. Provide references and documentation of certification and experience with submittals.
Material classification:	Spray-applied monolithic urethane resin liner. Materials per ASTM D638-Test Method for Tensile Properties of Plastics, and ASTM D790-Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
Surfaces:	Field applied to existing manholes. Coat all of interior of existing concrete, brick, and block manholes, including channels.
Color:	Natural color of resin.
Compressive Strength:	14,000 psi per ASTM D695
Tensile Strength:	7,000 psi per ASTM D638
Flexural Strength:	12,000 psi per ASTM D790
Flexural Modulus:	735,000 psi per ASTM D 790
Bond:	Shall exceed tensile strength of substrate
Density:	80 lb/cu. ft.
Service condition:	Immersed, non-potable, non-immersed, sewage, corrosive environment, interior and exterior water pressure, traffic areas.
Surface preparation:	Per paragraph 3.01. In addition to Section 3.01, application of manufacturer recommended primer for steel and cast iron. Inject or hand pack grout to seal holes, leaks and seeping. Do not apply to surfaces that are wet (including condensation) or covered with running water.
Repair materials:	Patching grout, infiltration control grout, and any other repair materials shall comply with the recommendations of the manufacturer. No holes or honeycomb surfaces should remain after the application of the repair mortar.
Environmental controls:	Minimum 50 degrees F. Less than 90% humidity and do not expose to rain or snow. Provide heaters, dehumidification, and ventilation as recommended by manufacturer and as needed to prevent condensation before and during cure. Provide sewage bypass as necessary.
Design:	The urethane liner thickness shall be designed to withstand the hydraulic load generated by the groundwater table. The invert and bench liner thickness shall be the same as that required at the bottom of the manhole wall as determined by the manufacturer's

	standard engineering calculations for groundwater pressure. Contractor to design the liner based on the groundwater table being one foot below the ground surface. Testing required for design values of the flexural modulus of the liner will be verified by a third party independent testing paid for by the Contractor . The test results and design information for each individual structure shall be submitted to the Project Representative for review.
Application:	Field application, manually sprayed onto all surfaces by trained technician who is experienced in the application of a spray applied urethane resin and has been certified by the manufacturer. Coating shall be applied within 48 hours of completion of surface preparation. The finished invert surfaces shall be smooth, free of ridges and will be sloped in the direction of flow. Special care shall be used to insure a smooth transition between the new manhole invert and intersection pipeline inverts such that flow will not be impaired. Manufacturer to certify equipment proposed for use by Contractor .
Curing:	Minimum of 30 minutes curing time after the completion of spraying before subjecting the manhole to active flow. A minimum of 3 hours curing time or until all sprayed materials have returned to the ambient temperature of the manhole interior before performing a vacuum test on the manhole. In cold weather, manhole shall be protected while curing is in process to maintain temperatures above 508F.
Thickness:	Per manufacturer's design.
Tolerances:	Plus 20 mils or minus 10 mils.
Cleanup:	As required. Dispose of solvent and debris as required by code.
Inspection Check Points:	See Paragraph 1.07D. Check Points 1 through 11.

NTS: REVISE CHECK POINTS AS APPROPRIATE.

Coating System Identification: **Product F**

Manufacturer:	SOUTHWESTERN PACKING & SEALS Inc., Shreveport, LA. 318-687-4330 or Fax 318-687-4337
Product name:	Ring Seal
Material Classification:	Trowel-applied two component, aliphatic, chemically curing, urethane sealant designed to seal the frame and adjustment ring area of manholes.
Surfaces:	Field applied to existing manholes. Coat interior of existing concrete, brick, and block manholes adjusting rings.
Color:	As provided by manufacturer.
Tensile Strength:	1100 psi per ASTM D412
Movement Capability:	50% per ASTM C719
Ultimate Elongation:	750% per ASTM D412
Hardness, Shore A:	50 per ASTM C661
Low Temp. Flexibility:	Passing at -4 degrees F, per ASTM D1790
Heat Aging:	2 percent, per ASTM C920
Recovery:	98 percent, per ASTM C920
Bond Durability:	Test blocked at 25 percent for 48 hours
Service condition:	Immersed, non-potable, non-immersed, sewage, corrosive environment, interior and exterior water pressure, traffic areas.
Surface preparation:	Sand blast to remove loose material and rust. The use of acid for cleaning purposes, no matter how dilute, shall not be allowed. Loose or protruding brick, mortar and concrete shall be removed by using a mason's hammer and chisel. Fill any large voids with quick setting patch mix as described herein. Do not apply to surfaces that are wet (including condensation) or covered with running water.
Repair materials:	As recommended by manufacturer.
Environmental controls:	Minimum 50 degrees F temperatures, less than 90 percent humidity and do not expose to rain or snow. Provide heaters, dehumidification, and ventilation as recommended by manufacturer and as needed to prevent condensation before and during cure.
Design:	The product shall be designed to cure rapidly, accommodate ground movement, provide excellent chemical and corrosion resistance, work in heavy traffic areas, and provide abrasion resistance. Product shall contain no asphalt or coal tar additives. Product shall withstand the hydraulic pressure generated by the groundwater table being at the ground surface.
Application:	Field application. Trowel-applied to the adjustment ring area. Apply a minimum of 3 inches above the bottom of the frame and 3 inches below the lowest adjustment ring. Coating shall be applied within 48 hours of completion of surface preparation.

	Brush on primer coat. When primer coat becomes tacky, thoroughly mix parts A & B then trowel or brush this mixture onto the prepared surfaces.
Curing:	Product shall be tack free within 60 minutes and fully cured within 24 hours.
Thickness:	Minimum thickness of 120 mils.
Tolerances:	Plus 40 mils or minus 10 mils.
Cleanup:	As required. Dispose of solvent and debris as required by code.
Inspection Check Points:	See Paragraph 1.06D. Check Points 5, 7, 9, and 10.

NTS: REVISE CHECK POINTS AS APPROPRIATE.

Coating System Identification:	**Product G**
Manufacturer:	SEALING SYSTEMS Inc., Loretto, MN. 763-478-2057, 800-478-2054 or Fax 763-478-8868
Product name:	Flex Seal Utility Sealant
Material Classification:	Spray, brush, or trowel-applied two component, 90 percent solids by volume, aromatic urethane rubber sealant designed to seal the frame and adjustment ring area of manholes. Must meet the physical requirements of ASTM D412.
Surfaces:	Field applied to existing manholes. Coat interior of existing concrete, brick, and block manholes adjusting rings.
Color:	As provided by manufacturer.
Tensile Strength:	1,150 psi per ASTM D412
Elongation:	800 percent per ASTM D412
Hardness (Durometer):	75 per ASTM D2240
Adhesive Strength:	175 lb l/in. per ASTM D903
Service condition:	Immersed, non-potable, non-immersed, sewage, corrosive environment, interior and exterior water pressure, traffic areas.
Surface preparation:	Sand blast or water blast at minimum 5000 psi at 4 gpm to remove loose material and rust. The use of acid for cleaning purposes, no matter how dilute, shall not be allowed. Loose or protruding brick, mortar and concrete shall be removed by using a mason's hammer and chisel. Fill any large voids with quick setting patch mix as described herein. Primer as recommended by manufacturer. Do not apply coating to surfaces that are wet (including condensation) or covered with running water.
Repair materials:	As recommended by manufacturer.
Environmental controls:	Minimum 45 degrees F temperatures, less than 90 percent humidity and do not expose to rain or snow. Surface shall be dry prior to application of primer and coating. Provide heaters, dehumidification, and ventilation as recommended by manufacturer and as needed to prevent condensation before and during cure.
Design:	The product shall be designed to cure rapidly, accommodate ground movement, provide excellent chemical and corrosion resistance, work in heavy traffic areas, and provide abrasion resistance. Product shall contain no asphalt or coal tar additives. Product shall withstand the hydraulic pressure generated by the groundwater table being at the ground surface.
Application:	Field application. Primer as recommended by manufacturer. Spray, brush, or trowel-applied to the adjustment ring area. Apply a minimum of 3 inches above the bottom of the frame and 3 inches below the lowest adjustment ring. Coating shall be applied within 48 hours of completion of surface preparation. Certified applicator required – manufacturer to provide or verify certification.

Curing:	Product shall be tack free within four hours at 70 degrees F and fully cured within 24 hours.
Thickness:	Minimum thickness of 120 mils.
Tolerances:	Plus 40 mils or minus 10 mils.
Cleanup:	As required. Dispose of solvent and debris as required by code.
Inspection Check Points:	See Paragraph 1.06D. Check Points 5, 7, 9, and 10.

NTS: REVISE CHECK POINTS AS APPROPRIATE.

Coating System Identification:	**Product H**
Manufacturer:	PERMA-LINER INDUSTRIES Inc., Clearwater, FL. 727-507-9749 or Fax 727-507-9849
Product name:	Perma-Flex Manhole Chimney Seal
Material Classification:	Brush or trowel-applied, three component, 93 percent solids by volume, lime hydrate and catalyst elastomer sealant designed to seal the frame and adjustment ring area of manholes. Must meet the physical requirements of ASTM D412.
Surfaces:	Field applied to existing manholes. Coat interior of existing concrete, brick, and block manholes adjusting rings.
Color:	As provided by manufacturer.
Tensile Strength:	1,200 psi per ASTM D412
Elongation:	400 percent per ASTM D412
Hardness, Shore D:	80 per ASTM C2440
Service condition:	Immersed, non-potable, non-immersed, sewage, corrosive environment, interior and exterior water pressure, traffic areas.
Surface preparation:	Sand blast or water blast at minimum 5000 psi at 4 gpm to remove loose material and rust. The use of acid for cleaning purposes, no matter how dilute, shall not be allowed. Loose or protruding brick, mortar and concrete shall be removed by using a mason's hammer and chisel. Fill any large voids with quick setting patch mix as described herein. Primer as recommended by manufacturer. Surfaces must be dry. Do not apply coating to surfaces that are wet (including condensation) or covered with running water.
Surface profile:	Manufacturer recommended surface profile created with abrasive blasting or high pressure washing.
Repair materials:	As recommended by manufacturer.
Environmental controls:	Minimum 45 degrees F temperatures, less than 90 percent humidity and do not expose to rain or snow. Surface shall be dry prior to application of primer and coating. Provide heaters, dehumidification, and ventilation as recommended by manufacturer and as needed to prevent condensation before and during cure.
Design:	The product shall be designed to cure rapidly, accommodate ground movement, provide excellent chemical and corrosion resistance, work in heavy traffic areas, and provide abrasion resistance. Product shall contain no asphalt or coal tar additives Product shall withstand the hydraulic pressure generated by the groundwater table being at the ground surface.
Application:	Field application. Primer as recommended by manufacturer. Brush or trowel-applied to the adjustment ring area. Surface must be dry. Apply a minimum of 3 inches above the bottom of the frame and 3 inches below the lowest adjustment ring. Coating shall be applied within 48 hours of completion of surface preparation.

Curing:	10 to 20 minute pot life and 60 minute set time.
Thickness:	Minimum thickness of 1/4-inch.
Tolerances:	Plus 1/8-inch.
Cleanup:	As required. Dispose of solvent and debris as required by code.
Inspection Check Points:	See Paragraph 1.06D. Check Points 5, 7, 9, and 10.

NTS: REVISE CHECK POINTS AS APPROPRIATE.

Coating System Identification:	**Product J**
Manufacturer:	Strong-Seal Systems, 4418 Emmett Sanders Rd., Pine Bluff, AR 71611 870-536-3453 or 800-235-9057
Product name:	Strong-Seal Systems MS-2C Liner
Qualifications:	Applicator shall be trained and certified by the manufacturer as qualified to apply the specified coating. Applicator shall have a minimum of either three years experience or a have used this product on a minimum of 100 manholes. Provide references and documentation of certification and experience with submittals.
Material classification:	Spray-applied, monolithic, fiber-reinforced, structurally enhanced, calcium aluminate cementitious-based liner material
Surfaces:	Field applied to existing manholes. Coat all of interior of existing concrete, brick, and block manholes, including channels.
References:	ASTM C 78 - Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading). ASTM C 94 - Ready-Mixed Concrete. ASTM C 109 - Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens). ASTM C 234 - Comparing Concretes on the Basis of the Bond Developed with Reinforcing Steel. ASTM C 267 - Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings. ASTM C 321 - Bond Strength of Chemical-Resistant Mortars. ASTM C 496 - Splitting Tensile Strength of Cylindrical Concrete Specimens. ASTM C 596 - Drying Shrinkage of Mortar Containing Portland Cement. ASTM C 666 - Resistance of Concrete to Rapid Freezing and Thawing. ASTM C 827 - Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures. ASTM C 952 - Bond Strength of Mortar to Masonry Units.
Color:	As provided by manufacturer.
Cement:	Calcium aluminate cement.
Compressive Strength:	5,000 psi at 28 days per ASTM C109
Tensile Strength:	580 psi at 28 days per ASTM C496
Flexural Strength:	780 psi at 28 days per ASTM C78
Shrinkage:	0 percent at 28 days, 90 percent relative humidity, per ASTM C 596.
Bond Strength:	2000 psi at 28 days per ASTM C952
Density:	Minimum 110 lb/cu. ft, applied.
Fiber Reinforcement:	1/2 to 5/8 inch alkaline-resistant fiberglass rods.

Service condition:	Immersed, non-potable, non-immersed, sewage, corrosive environment, interior and exterior water pressure, traffic areas.
Surface preparation:	Per paragraph 3.01. In addition to Section 3.01, application of manufacturer recommended primer for steel and cast iron. Inject or hand pack manufacturer recommended grout to seal holes, leaks and seeping. Surface shall be damp and totally saturated with water but without noticeable condensation, free water droplets or running water, before application of liner material.
Repair materials:	Repair with manufacturer recommended grout.
Environmental controls:	Range of 50 degrees F-85 degrees F air, substrate, and materials during mixing, application, and curing. Do not apply materials to frozen surfaces or if freezing is expected within substrate within 24 hours after application. Work in shade and maintain shade from 24 hours before and until initial set. Do not exceed water temperature of 80 degrees F. Maintain less than 90% humidity and do not expose to water, rain or snow. Provide heaters, dehumidification, and ventilation as recommended by manufacturer and as needed to prevent condensation before and during cure. Provide sewage bypass as necessary.
Application:	Field application, spray applied onto all surfaces by trained technician who is experienced in the application of this product and has been certified by the manufacturer. Coating applied per manufacturer's recommendations. Coating shall be applied within 48 hours of completion of surface preparation. Mix liner material with water in accordance with manufacturer's instructions. Discharge prepared mix into hopper. Continue mixing as liner material is continuously sprayed. Trowel surface of sprayed liner material to relatively smooth finish. Do not over trowel. Apply brush finish to trowel finished surface. The finished invert surfaces shall be smooth, free of ridges and shall be sloped in the direction of flow. Special care shall be used to insure a smooth transition between the new manhole invert and intersection pipeline inverts such that flow will not be impaired.
Curing:	Comply with all manufacturer's recommendations for curing. Minimize exposure of applied materials to sunlight and air movement. Cover structure if time between application of additional coats is to be longer than 15 minutes. Do not expose finished materials to sunlight or air movement for longer than 15 minutes before covering or closing access. Shade manhole while rehabilitation is in process in hot and arid climates. Apply manufacturer recommended concrete curing compound if relative humidity is less than 70 percent within manhole. Allow minimum 4 hour cure time before subjecting manhole to flows or surcharge. Do not allow traffic for a minimum of 24 hours after final application of liner material.
Thickness:	Minimum thickness at invert of 1/2 inch. Minimum 1/2-inch thick everywhere else.
Cleanup:	MEK solvent or as recommended by manufacturer. Dispose of solvent and debris as required by code.
Inspection Check Points:	See Paragraph 1.07D. Check Points 1 through 11. Vacuum testing for acceptance shall not be performed earlier than 7 days after

application.

NTS: REVISE CHECK POINTS AS APPROPRIATE.

Coating System Identification: **Product K**

Manufacturer:	Quadex Sewer Rehabilitation Products 1 County Club Circle, Maumelle, AR 72113 501-803-9400 or 888-831-1650
Product name:	Quadex Aluminaliner
Qualifications:	Applicator shall be trained and certified by the manufacturer as qualified to apply the specified coating. Applicator shall have a minimum of either three years experience or a have used this product on a minimum of 100 manholes. Provide references and documentation of certification and experience with submittals.
Material classification:	Spray-applied, monolithic, fiber-reinforced, structurally enhanced, calcium aluminate cementitious-based liner material
Surfaces:	Field applied to existing manholes. Coat all of interior of existing concrete, brick, and block manholes, including channels.
References:	ASTM C 78 - Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading). ASTM C 94 - Ready-Mixed Concrete. ASTM C 109 - Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens). ASTM C 234 - Comparing Concretes on the Basis of the Bond Developed with Reinforcing Steel. ASTM C 267 - Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings. ASTM C 321 - Bond Strength of Chemical-Resistant Mortars. ASTM C 496 - Splitting Tensile Strength of Cylindrical Concrete Specimens. ASTM C 596 - Drying Shrinkage of Mortar Containing Portland Cement. ASTM C 666 - Resistance of Concrete to Rapid Freezing and Thawing. ASTM C 827 - Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures. ASTM C 952 - Bond Strength of Mortar to Masonry Units.
Color:	As provided by manufacturer.
Cement:	Calcium aluminate cement.
Compressive Strength:	5,000 psi at 28 days per ASTM C109
Tensile Strength:	580 psi at 28 days per ASTM C496
Flexural Strength:	780 psi at 28 days per ASTM C78
Shrinkage:	0 percent at 28 days, 90 percent relative humidity, per ASTM C 596.
Bond Strength:	2000 psi at 28 days per ASTM C952
Density:	Minimum 110 lb/cu. ft, applied.
Fiber Reinforcement:	1/2 to 5/8 inch alkaline-resistant fiberglass rods.

Service condition:	Immersed, non-potable, non-immersed, sewage, corrosive environment, interior and exterior water pressure, traffic areas.
Surface preparation:	Per paragraph 3.01. In addition to Section 3.01, application of manufacturer recommended primer for steel and cast iron. Inject or hand pack manufacturer recommended grout to seal holes, leaks and seeping. Surface shall be damp and totally saturated with water but without noticeable condensation, free water droplets or running water, before application of liner material.
Repair materials:	Repair with manufacturer recommended grout.
Environmental controls:	Range of 50 degrees F-85 degrees F air, substrate, and materials during mixing, application, and curing. Do not apply materials to frozen surfaces or if freezing is expected within substrate within 24 hours after application. Work in shade and maintain shade from 24 hours before and until initial set. Do not exceed water temperature of 80 degrees F. Maintain less than 90% humidity and do not expose to water, rain or snow. Provide heaters, dehumidification, and ventilation as recommended by manufacturer and as needed to prevent condensation before and during cure. Provide sewage bypass as necessary.
Application:	Field application, spray applied onto all surfaces by trained technician who is experienced in the application of this product and has been certified by the manufacturer. Coating applied per manufacturer's recommendations. Coating shall be applied within 48 hours of completion of surface preparation. Mix liner material with water in accordance with manufacturer's instructions. Discharge prepared mix into hopper. Continue mixing as liner material is continuously sprayed. Trowel surface of sprayed liner material to relatively smooth finish. Do not over trowel. Apply brush finish to trowel finished surface. The finished invert surfaces shall be smooth, free of ridges and shall be sloped in the direction of flow. Special care shall be used to insure a smooth transition between the new manhole invert and intersection pipeline inverts such that flow will not be impaired.
Curing:	Comply with all manufacturer's recommendations for curing. Minimize exposure of applied materials to sunlight and air movement. Cover structure if time between application of additional coats is to be longer than 15 minutes. Do not expose finished materials to sunlight or air movement for longer than 15 minutes before covering or closing access. Shade manhole while rehabilitation is in process in hot and arid climates. Apply manufacturer recommended concrete curing compound if relative humidity is less than 70 percent within manhole. Allow minimum 4 hour cure time before subjecting manhole to flows or surcharge. Do not allow traffic for a minimum of 24 hours after final application of liner material.
Thickness:	Minimum thickness at invert of 1/2 inch. Minimum 1/2-inch thick everywhere else.
Cleanup:	MEK solvent or as recommended by manufacturer. Dispose of solvent and debris as required by code.
Inspection Check Points:	See Paragraph 1.07D. Check Points 1 through 11. Vacuum testing for acceptance shall not be performed earlier than 7 days after

application.

NTS: REVISE CHECK POINTS AS APPROPRIATE.

Coating System Identification: **Product L**

Manufacturer:	Sauereisen 160 Gamma Drive, Pittsburgh, PA 15238-2989 412-963-0303
Product name:	Sauereisen Sewerseal No. F-170.
Qualifications:	Applicator shall be trained and certified by the manufacturer as qualified to apply the specified coating. Applicator shall have a minimum of either three years experience or a have used this product on a minimum of 100 manholes. Provide references and documentation of certification and experience with submittals.
Material classification:	Spray-applied, monolithic, fiber-reinforced, structurally enhanced, calcium aluminate cementitious-based liner material
Surfaces:	Field applied to existing manholes. Coat all of interior of existing concrete, brick, and block manholes, including channels.
References:	ASTM C 78 - Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading). ASTM C 94 - Ready-Mixed Concrete. ASTM C 109 - Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens). ASTM C 234 - Comparing Concretes on the Basis of the Bond Developed with Reinforcing Steel. ASTM C 267 - Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings. ASTM C 321 - Bond Strength of Chemical-Resistant Mortars. ASTM C 496 - Splitting Tensile Strength of Cylindrical Concrete Specimens. ASTM C 596 - Drying Shrinkage of Mortar Containing Portland Cement. ASTM C 666 - Resistance of Concrete to Rapid Freezing and Thawing. ASTM C 827 - Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures. ASTM C 952 - Bond Strength of Mortar to Masonry Units.
Color:	As provided by manufacturer.
Cement:	Calcium aluminate cement.
Compressive Strength:	5,000 psi at 28 days per ASTM C109
Tensile Strength:	580 psi at 28 days per ASTM C496
Flexural Strength:	780 psi at 28 days per ASTM C78
Shrinkage:	0 percent at 28 days, 90 percent relative humidity, per ASTM C 596.
Bond Strength:	2000 psi at 28 days per ASTM C952
Density:	Minimum 110 lb/cu. ft, applied.
Fiber Reinforcement:	1/2 to 5/8 inch alkaline-resistant fiberglass rods.

Service condition:	Immersed, non-potable, non-immersed, sewage, corrosive environment, interior and exterior water pressure, traffic areas.
Surface preparation:	Per paragraph 3.01. In addition to Section 3.01, application of manufacturer recommended primer for steel and cast iron. Inject or hand pack manufacturer recommended grout to seal holes, leaks and seeping. Surface shall be damp and totally saturated with water but without noticeable condensation, free water droplets or running water, before application of liner material.
Repair materials:	Repair with manufacturer recommended grout.
Environmental controls:	Range of 50 degrees F-85 degrees F air, substrate, and materials during mixing, application, and curing. Do not apply materials to frozen surfaces or if freezing is expected within substrate within 24 hours after application. Work in shade and maintain shade from 24 hours before and until initial set. Do not exceed water temperature of 80 degrees F. Maintain less than 90% humidity and do not expose to water, rain or snow. Provide heaters, dehumidification, and ventilation as recommended by manufacturer and as needed to prevent condensation before and during cure. Provide sewage bypass as necessary.
Application:	Field application, spray applied onto all surfaces by trained technician who is experienced in the application of this product and has been certified by the manufacturer. Coating applied per manufacturer's recommendations. Coating shall be applied within 48 hours of completion of surface preparation. Mix liner material with water in accordance with manufacturer's instructions. Discharge prepared mix into hopper. Continue mixing as liner material is continuously sprayed. Trowel surface of sprayed liner material to relatively smooth finish. Do not over trowel. Apply brush finish to trowel finished surface. The finished invert surfaces shall be smooth, free of ridges and shall be sloped in the direction of flow. Special care shall be used to insure a smooth transition between the new manhole invert and intersection pipeline inverts such that flow will not be impaired.
Curing:	Comply with all manufacturer's recommendations for curing. Minimize exposure of applied materials to sunlight and air movement. Cover structure if time between application of additional coats is to be longer than 15 minutes. Do not expose finished materials to sunlight or air movement for longer than 15 minutes before covering or closing access. Shade manhole while rehabilitation is in process in hot and arid climates. Apply manufacturer recommended concrete curing compound if relative humidity is less than 70 percent within manhole. Allow minimum 4 hour cure time before subjecting manhole to flows or surcharge. Do not allow traffic for a minimum of 24 hours after final application of liner material.
Thickness:	Minimum thickness at invert of 1/2 inch. Minimum 1/2-inch thick everywhere else.
Cleanup:	MEK solvent or as recommended by manufacturer. Dispose of solvent and debris as required by code.

Inspection Check Points:	See Paragraph 1.07D. Check Points 1 through 11. Vacuum testing for acceptance shall not be performed earlier than 7 days after application.

NTS: REVISE CHECK POINTS AS APPROPRIATE.

END OF SECTION